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GENTLEMAN FARMING.



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From

William Lumsden

Per J. D. Lyles.

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TEN YEARS
OF
GENTLEMAN FARMING

AT

BLENNERHASSET,

WITH CO-OPERATIVE OBJECTS.

BY

WILLIAM LAWSON;
CHARLES D. HUNTER, F.C.S.;
AND OTHERS.

LONDON:
LONGMANS, GREEN, & CO.

1874.



H.D
1491
G7 L4

“Go, little book, God send thee good passage,
And specially let this be thy prayere
Unto them all that thee will read or hear,
Where thou art wrong, after their help to call,
Thee to correct in any part or all.”

Chaucer.

P R E F A C E.

THE purpose of this book can only be fully understood by the perusal of it. Chiefly, it is intended to correct false impressions; and to furnish a truer idea of our aims, and of the actual progress of our Farming and Social experiments.

There are many reasons, besides those purely local, why we should make public this History of our Ten Years of Gentleman Farming. Many of the field experiments are new, and likely to prove of value to the agriculturist. The Field and Crop Balance-sheets will, we hope, go some way to supply a want which we, in common with most beginners in farming, felt repeatedly. Many valuable tables and agricultural facts and statistics, calculated and condensed from various sources, are also given; which cannot be readily obtained elsewhere, except by those who have the command of a large and varied library.

To enable myself to tell a true tale, I have overhauled the archives, re-read Mr. Lawson's diary, examined the "Council" and "Parliamentary" minutes, and analysed and rearranged many of the field experiments.

These agricultural experiments were at first intended by Mr. Lawson to occupy the first place in this book; but it seemed to me, that our Co-operative and Farming History was likely to prove more generally interesting; and should consequently receive, if possible, more attention at our hands, and occupy the foremost place. This arrangement has been adopted,—perhaps at the expense of making the contents somewhat incongruous; though, indeed, to include

even the briefest sketch of our varied doings at Blennerhasset, they could not well be otherwise.

The Blennerhasset establishment referred to, existed during ten years—namely, from 1862 to 1872. It included a farm, extensive farm buildings, a market garden, artificial manure works, steam-ploughing machinery, a laboratory, a free library, a free school, and several grocery shops. Its headquarters were at Blennerhasset, a village of about 200 inhabitants, on the south side of the little trout stream, the Ellen, about 18 miles west of Carlisle, and about 10 miles east of Maryport.

In as far as I am responsible for the matter and arrangement of the book, I claim indulgent criticism; on the ground principally of my inexperience in authorship; and also, because, being wishful to complete some departments of the history, which I had not anticipated having to do, I have written much that I had neither convenient time, nor indeed the necessary knowledge, to write well.

I also desire to record here our indebtedness to Mr. Holyoake, for many useful hints and still more useful excisions; without which the book would have been less presentable than it now is.

CHARLES D. HUNTER.

GLASGOW, *September*, 1874.

With regard to portions of this book written by me, I am not only indebted to others for various emendations, but unable to superintend their passage through the press.

WILLIAM LAWSON.

WARWICK, MASS., U.S.A.

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ERRATA.

Page 148, line 13, column 1872, read £36 instead of £37.

" " " 13, " Total, " £43 " £44.

" " " 19, " 1872, " £1153 " £1154.

" 153, " 5, transpose " got " to before " fixed."

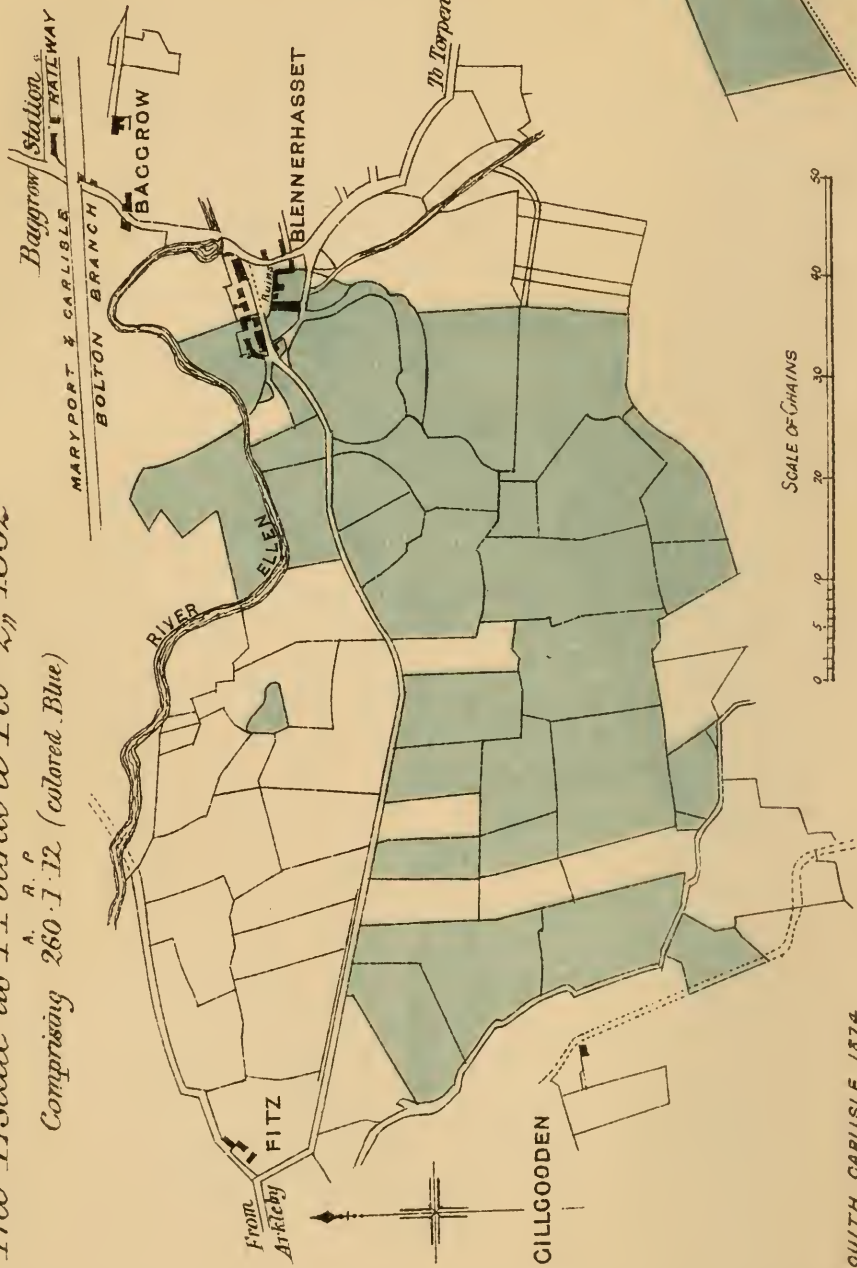
" 187, " 23, read 185 instead of 867.

" 221, " 19, " £8 " £3.

" 326, last line, add "The above list show nothing for potatoes
they being taken direct from the pits. Twopence a-week may
be added for them."

The Estate as I Found it Feb'y 2^d 1862

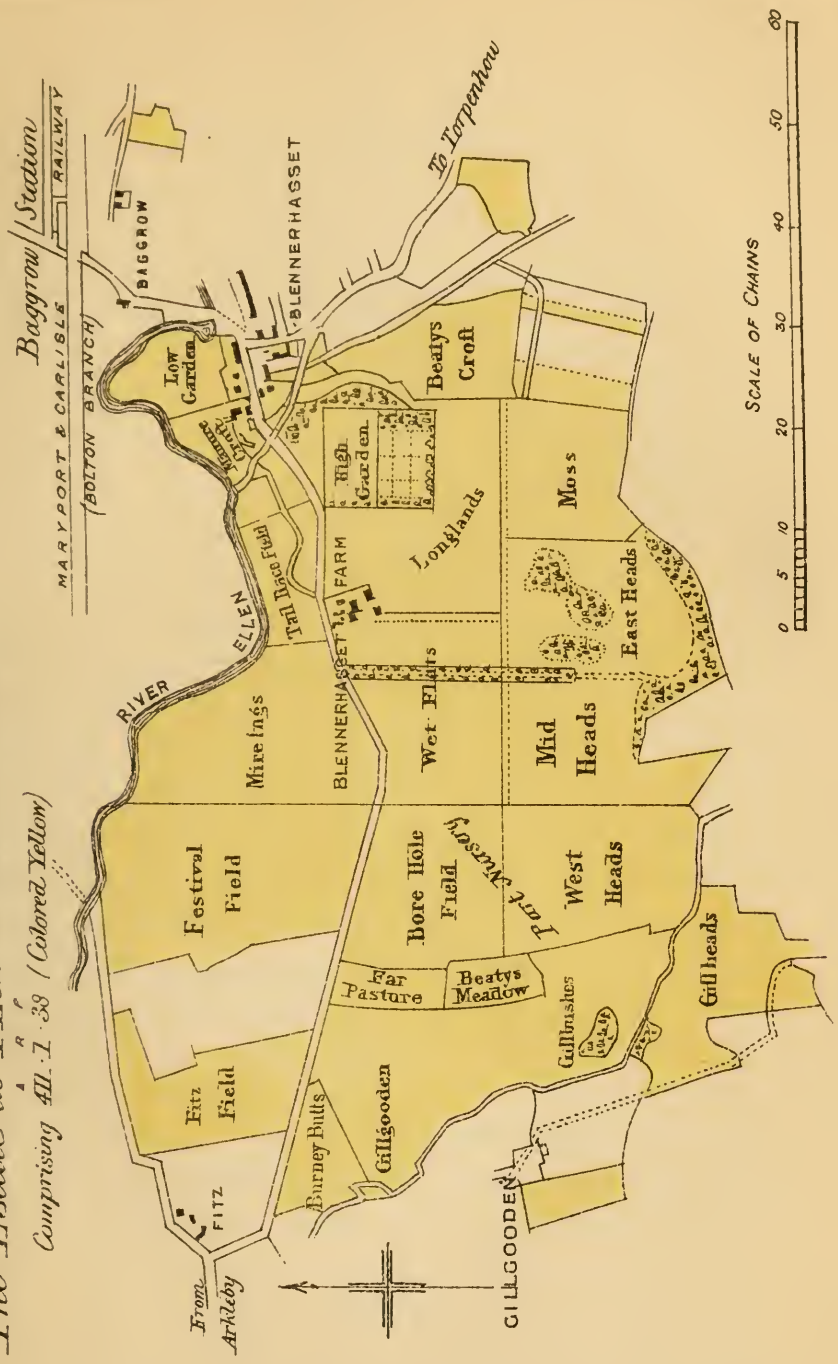
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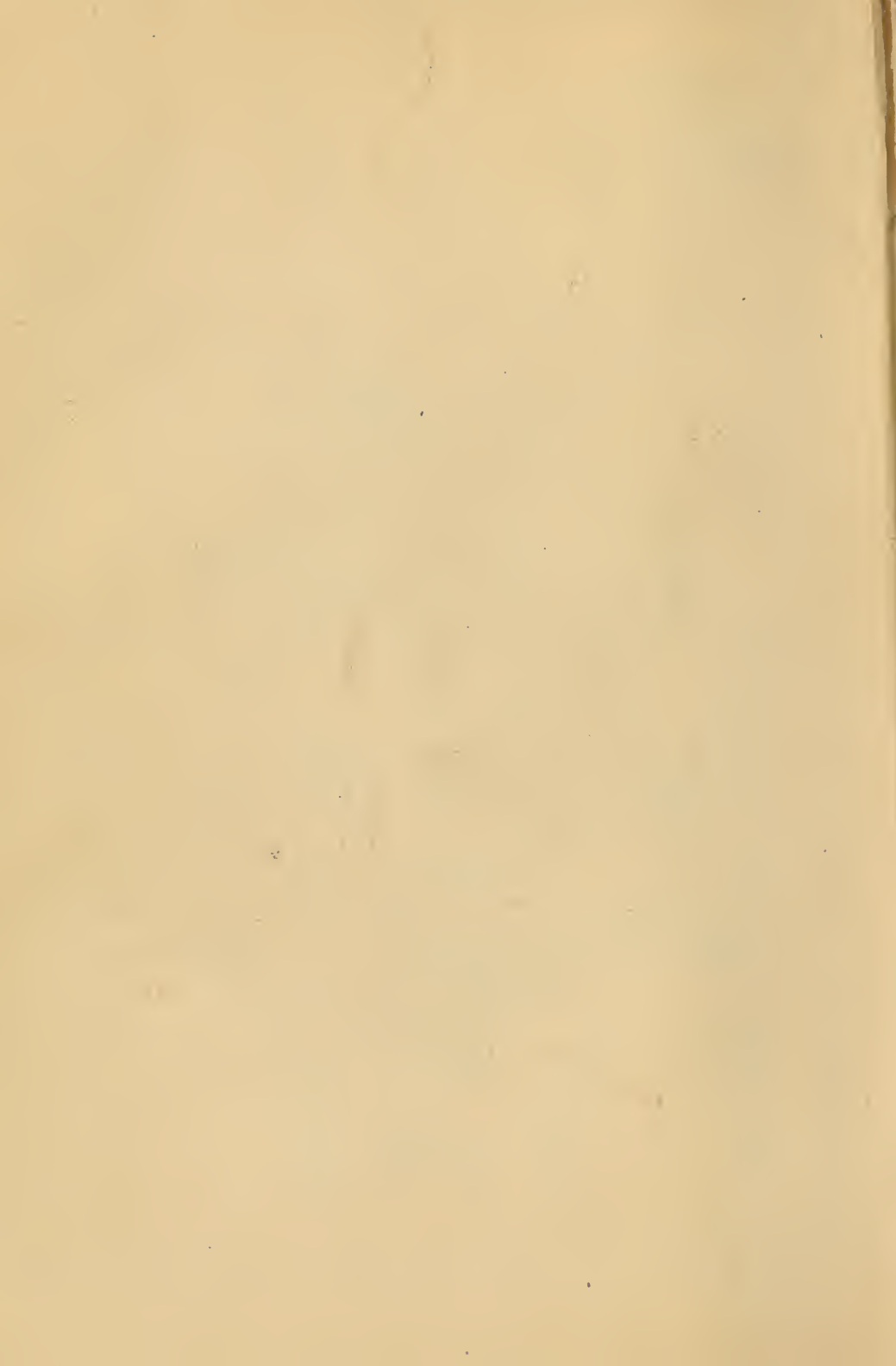


ASQUITH, CARLISLE, 1874.

G. Thurnam & Sons, Lithog^s Carlisle

The Estate as I left it Feb'y 2^d 1872 *Comprising 411.1^a 1^r 38 (Colored Yellow)*





TEN YEARS

OF

GENTLEMAN FARMING.

INTRODUCTORY.

DIFFICULTIES OF THE PUBLIC SERVICE.

DURING Mr. Lawson's last visit to Egypt, I was asked to look over some MSS. left by him, and judge whether it would be-useful to publish them. After visiting the place to which the MSS. related, and perusing the narrative by the light of information gathered upon the spot, I had no hesitation in thinking that the story of "Ten Years at Blennerhasset" was-worth printing, seeing how scant is the literature of social experiments. I volunteered, moreover, to give my impressions of the story by way of introduction to it; since what I had observed, in writing a "History of Co-operation in England," had convinced me that the general public know very little of the "Difficulties of the Public Service" in the direction of social improvement; and that if they knew more, they would judge with less severity than they do, the inevitable errors made in that form of disinterested effort.

Those who originate personal experiments in social life, or introduce the social element into industry, have more difficulty to encounter than in attempting some new thing

Prejudices to be encountered.

in manufacture. In discovery, or mechanical invention, sufficient opposition is encountered from persons who dislike any change, and those who are interested in what is already established, and whose property would be damaged if the new system prevailed; while in social experiments further opposition of a more vicious order is met. Prejudices of a political, social, or even of a religious character, have to be encountered; so that a pioneer in this direction not only gets no help, but meets with active hindrance. He is not only thought to be no wiser than he ought to be, but he is said to be no better than he should be; and it is a very mild form of dissent to suggest that he is eccentric, with a tendency to something very well understood as the further and final stage of that malady. Hence it follows that persons who attempt any form of social improvement have commonly very little experience to guide them; for very few experiments have previously been made. Where ten thousand experiments are attempted in art and science, not ten are tried in this department of human progress.

The reader will not proceed far before he discerns that Mr. Lawson never hesitates to tell a story against himself—indeed, he writes with self-depreciating candour; and if he does not actually take a pleasure in giving the reader an impression to his own disadvantage, he does not take any trouble to give him a favourable one. Perceiving how ingeniously and persistently people who have not been successful hide from themselves, and endeavour to hide from others, the causes of their failure, Mr. Lawson, justly disliking this, seems to me to go rather to the opposite extreme. This is a better and more honourable course than

Difference between Social and Mechanical experiments.

the other ; still the reader who wishes to form a just opinion will notice that it is an extreme.

He who ventures to peruse the following pages will find recorded a number of curious social incidents and proceedings. In all the literature of British social experiments I have not often met with so many calculated to startle the prosaic and conventional Englishman.

Industrial Partnerships are now accepted facts in commercial undertakings. When Mr. Lawson adopted the principle at Blennerhasset, he was probably the only gentleman in England who had committed his fortune to what was then regarded as certain peril. Better methods exist now of giving the labourer a share of the profits ; but they were mostly unknown then, save as theoretical speculations, such as those Mr. Babbage devised. No scheme was in force for estimating the profits which might accrue from the personal interest and voluntary industry of the labourers, so that they could judge what degree of advantage was likely to accrue to themselves. If a reserve fund was set apart for the introduction of improvements and new machinery, it would, in due course, provide sufficient for the proprietor to pursue the development of his estate. This is now in general provided for before the division of profits with the labourers commences. But, as no arrangement of this kind was in force at Blennerhasset, the labourers were, of course, uncertain whether Mr. Lawson's costly experiments, so much beyond their knowledge and their confidence, might not extinguish all chance of profit to them. During the earlier years of this experiment, many documents existed relative to its proceedings which were not preserved, no one

Explanations to Co-operators.

foreseeing that they might one day be matters of interest or curiosity to others. Of these disregarded papers, a portion of one read to the members and workers brought together, has been preserved by accident. It was an address by Mr. Lawson on the question, "Is it desirable that the workers on the Blennerhasset Farm be direct partakers of its returns?" The paper seems to me to have been remarkable for its clear, considerate, and explicit statements. I had search made for the missing portions, which, however, could not be found; else it would have been relevant to have quoted the whole here, as illustrative of the kind and quality of information given to the labourers.

Mr. Lawson said "he had been asked to explain, as well as he could, the meaning of the question they had met to discuss." This occurred at one of the early nights (in 1863) of their meeting together to debate their affairs. "The first thing that stood before them," Mr. Lawson said, "was the desirability of determining the value of a particular course of conduct, before considering its possibility; because those who are persuaded that a thing is desirable, will give more vigour and attention to the facts which tend to show that it is possible. Besides, by considering first whether a course is desirable, if it is found it is not so, a person is saved all trouble in considering whether it is possible. Many people never master the distinction between desirability and possibility. I want you," said Mr. Lawson, "to feel no longer that you are merely working *for* me, but that you are really working *with* me, as cultivators of the soil; with a view to participation in the profits, if we can make them. There is a great difference between working *for* and *with*

The Spirit of Co-operative Work.

a person ; and if this is not very clear in the mind, there will be confusion in practice." Then, before detailing what he proposed to do upon the Farm, he reasoned out the points he had stated. "First, then (he asked), Is what we propose desirable?—by this I mean would it be a good thing if it could be accomplished? and, as we proceed, each will distinguish between the question, Is it desirable? and the question, Is it possible, or practicable? If the question were asked, Is it desirable that everybody be healthy and wise? the answer would undoubtedly be Yes; but if we said, Is it possible for everyone to be wise and healthy? that would be quite a different question, and the answer might be No. When a particular course of conduct is presented to a man's mind, it seems wise for him to consider, 'Is such a course desirable?' before considering, 'Is such a course possible?' For if, after giving due attention to the question, 'Do I desire the thing?' he answers with a 'No,' he will, as I have said, be able to set his mind at rest on the subject, and be freed from the necessity of a fruitless investigation as to the thing's being practicable. I should suppose that when a man entered with good will, and with intelligent knowledge of what he was about, it would be a greater advantage to the undertaking, and all concerned, than if he neither knew nor cared what he was doing. For myself, I must contribute in some way to the confidence necessary, by reciprocating, as far as I can, any you may show. A farmer who had so much improved the management of his estate that his neighbour's attention was attracted to it, was once asked how it was that he had done so well upon a farm

Intelligent and Pecuniary Conditions of Success.

where the previous occupier had lost money. He said the reason of his success was, that when he was carrying on work on the farm, he said, '*Come, lads, let's do such a thing,*' whereas the farmer before him used to say, '*Go and do such a thing.*' Now, I want to be able to say to you in spirit and in effect, if not in so many words, '*Come with me and let us do such a thing.*' I certainly cannot expect, or wish, that you should more intimately join with me in a concern, unless you understand the design and the system which is proposed to be carried out. Therefore let me tell you first of all that I am of opinion that the most profitable system of farming is that which is commonly called High Farming. And here let us compare a farm with a warehouse. Suppose the occupier of the warehouse pays £100 a-year for the use of the premises; if he passes very few goods through his warehouse in the course of the year, he will have to pay very few labourers, and his daily expenses will be very small. This state of things resembles 'low farming.' But if he pass a very large quantity of goods through his warehouse in the course of the year, he will have to employ a great many hands, and his daily expenses will be proportionately heavy; yet, if he make a certain very small profit upon his goods, you will easily see that he will be able to pay his rent at the end of the year with much greater ease and advantage than he could if he had adopted the former course. Just so, if the farmer expend much money, judiciously, in obtaining those conditions on his farm which will secure abundant and valuable crops, the gross returns of his farm will increase in proportion to that expense; and, as the rent, rates, and taxes of his farm will

A "Gentleman" in Business.

remain the same, he will be a clear gainer by his adopting high instead of low farming. I believe, then, in deep cultivation, large applications of manure, and in growing the most valuable sorts of crops, although such crops may require a great amount of labour.

"Whatever be the advantages or disadvantages of buying and eating animal food, I believe in the profitableness of producing and selling it. I propose to keep several scores of milk cows in my new buildings all the year round; and to send new milk twice a-week to Newcastle or Carlisle."

Then Mr. Lawson gave further details of what he contemplated doing; and explained, as he went, the elementary misconceptions they were likely to make about his plans. All this was very thoughtful and practical, quite free from undue dreaminess and world-making; and was what a practical, sensible English gentleman ought to say to work-people whom he had invited to join him in a business enterprise. Mr. Lawson showed here more common-sense and practical sagacity than he has been credited with throughout his undertakings. He went into these the right way, if he came out of them the wrong way—through a generous latitudinarianism in industrial discipline which he permitted. Most new experiments fail through the timid parsimony of those who seek success without pecuniary risks to themselves. Mr. Lawson never did this. He provided ample money to give the thing a fair trial.

Over a co-operative store at Blennerhasset, until very recently, the visitor might see Mr. Lawson advertised as being in business. It seems absurd and eccentric that Mr. Lawson, a member of an old and wealthy family, should be

The Labourers and the Missionaries.

registered among his neighbours as a grocer ; and that the name of " William Lawson, licensed to deal in tobacco," should be written in white letters on a black board over a provision shop. But this eccentricity was the doing of the Registrar (under the Companies' Act) in London, who refused to register him as a " gentleman " ; under which very proper designation his name was sent up. The Registrar could not be made to understand that a gentleman was the promoter of a company of rustic provision dealers. Mr. Lawson, however, having the courage of his family, shrank from nothing necessary to give effect to his generous purpose ; however much it might involve him in misapprehension on the part of others, who would never know or care to enquire into the facts.

There is another episode in the following history which also deserves remark. Mr. George Moore, a well-known merchant of London, and who lends support to the London City Mission, habitually invites several of the city missionaries to Cumberland, his native county, at certain seasons of the year, for recreation and improvement of their health. Some years these missionaries were invited to the Blennerhasset estate ; and they were supported there, they and their families, and comfortably boarded at the farm house. The cost of this, which was paid out of the money appropriated to the " public good " fund, amounted some seasons to a considerable sum (£40 or £50) for these labourers to provide ; and of course made so much less to come to themselves ; yet to their honour, the labourers never grudged the amount, but treated " Mr. Moore's missionaries," as they were called, with a nice sense of respect. Only on one

The Blennerhasset Parliament.

occasion was a remark made which had a personal application. Some of the missionaries, not remembering whose guests they were, and exceeding their spiritual vocation, publicly objected in the village parliament to the labourers' voting higher wages to themselves ; which, they said, was voting money out of Mr. Lawson's pocket. The labourers did not relish this interference in their affairs, quite out of the missionaries' province ; and one rose up and said, " Perhaps the gentlemen forget that we pay for thee."

Though many of the votes in the village parliament had the effect, if they were acted on, of voting money, which Mr. Lawson had to pay, for purposes sometimes outside their own immediate concerns, there was no intention, on the part of the labourers, of taking it out of his pocket. They knew it would diminish the amount of money coming to themselves out of the " public good " fund, unless the higher wages proved more productive through the exertions and judgment exercised in the labour which would thence be undertaken. The Blennerhasset Parliament, as it was called, was, in a commercial point of view, a romantic institution ; while in the citizen point of view,—of enlarging the ideas, the interest, and independence of the frequenters,—it was very excellent. When I delivered a lecture in Blennerhasset recently, to an audience many of whom had been members of the old parliament, and among all of whom the traditions of it remained ; although they had seen little and knew little of co-operation as understood elsewhere, they were unquestionably persons of considerable intelligence, and who understood everything said to them. Nothing, however, could be more impracticable and disastrous, in

Universal Discussion.

a commercial sense, than setting apart a portion of the working time, for men and women to meet and discuss about what they should do : and the droll thing is, that they were paid for the time spent in debating whether they would do anything at all. It is to the credit of the men that one of the shepherds proposed that "we divide the three hours of mental toil, giving one to going over the farm ;"—to see the condition of it, and so have facts to discuss about. The honest man did not disguise from himself that the time was not usefully spent for industrial purposes ; and he called the three hours spent daily in council by the name of "mental toil" ; so as to satisfy his conscience, by a phrase, that he was doing something. That the industrial council was thrown open to anybody in the village, to come in with their conflicting and confusing advice, is one of the strangest things ever read of in an industrial enterprise. If the Cumberland peasant's head was not square and sound, the whole scheme would have been talked out of existence in three months, instead of lasting ten years. It was frequently proved that the women were the best *men of business*, and deserved to have a medal voted to them by the society for promoting the civil independence of that interesting sex. When the men were desirous of increasing their wages, they yet voted with the indecision of persons who considered *whether the concern could honestly afford it* ; and when a limit was proposed to be put to their wages, they voted for it : but when a proposal was made by one of the women that *their* wages should be increased, the whole thirteen attended ! One only entertained doubts of the fairness of the proposition, and twelve unanimously and at once voted in favour

Effects Unfavourable to Discipline and Progress.

of it! In this Parliament, persons and offices, as well as affairs, were debated. One result, scarcely foreseen, of putting to the vote the duration of an office, or the fitness of the holder to retain it, was that no officer felt certain of his situation. For, though the principal did not hold himself bound by the decisions of the open council, those decisions would necessarily have the force of public opinion, by which he might himself be influenced; or, if his own judgment remained unchanged, he might find it desirable to adopt the expressed opinion of all others engaged with him. In one instance, a labourer placarded a motion in the village for discussion, as to whether "the manager was fit for his place." This free and easy insubordination could not fail in producing its effects. It could not be a very pleasant thing for a manager to have his disqualifications, real or imaginary, pointed out and dwelt upon, perhaps by uninformed or malicious expositors; and, perhaps, a general resolution of the whole village come to, that he ought to be removed. Though, on the whole, there was a good nature and good temper displayed by managers, and by the men and women employed, the reader will see in the course of this narrative that the effect of these proceedings was unfavourable to discipline and progress. Yet I think we may conclude that, had there been practical experience sufficient to regulate, without destroying, the interest of the Co-operators, no important commercial harm would have resulted; and there is no doubt that these debates produced an amount of intelligence, and even sentiments of mutual respect among the Co-operators, which nothing else could have produced. I myself saw evidence, years after, of the undoubted personal

Mr. Lawson's Width of View.

regard in which Mr. Lawson was held among the common people,—a degree of respect which nothing so much as the experience of the generosity of the Co-operative principle, as represented by him, could have led them to entertain.

The reader, however, will do Mr. Lawson very great injustice if he does not take into account the object he had in view in all he did. That object was the promotion of what he called the “public good”; and that public good he conceived in a very unusual sense. It would, perhaps, have been better for industrial Co-operation had he confined himself simply to making his farms successful and profitable, by simply giving the labourers a pecuniary interest in their success, and thereby establishing the fact that such an arrangement paid commercially; which would have encouraged many other gentlemen, without half his humanity and good feeling, to carry out the same thing. But Mr. Lawson's object was not so much to make money as to make the people into prosperous and intelligent self-directing men and women; and he gave them the opportunity of this; and did make them intelligent; and conferred upon those near him such advantages as, I believe, no villagers in England ever possessed. Indeed Mr. Lawson always insisted on the width and universality of his efforts for the public good; and always held that a New Zealander was to be as free to advise him, and enjoy the public good expenditure, as those immediately employed by him. The Co-operative Societies, the Medical Dispensaries, the Schools, and Free Reading-rooms which he spread around the chief villages of the district, and some of which he still maintains, are all instances of objects, larger than co-operation is usually

Results really attained.

supposed to compass, which he generously promoted. These objects were, in fact, beyond what the neighbourhood understood. The poor are too seldom content to see the general advantage of others increased, even though they and their children are sharers of it. Their need compels them to desire to have a pecuniary advantage coming exclusively into their own hands ; and they would be more grateful for less benefits which came directly to them. The reader will see that in this case the larger benefits were really accorded to them : and, even in days when applause is freely given to those who succeed by selfishness, many will mitigate their censure of, if they cannot esteem, one who failed because he was too generous.

Such is the quality of the facts which may reward the curiosity of the reader who ventures through these pages.

GEORGE JACOB HOLYOAKE.

Explanatory Personal Facts.

CHAPTER I.

COMMENCEMENT OF FARMING.

IT is not of consequence to give, in this narrative, any biographical facts, except, perhaps, one or two which will help to explain how I came to take an interest in agricultural and Co-operative farming; and what kind of qualifications, or rather disqualifications, I had for the undertaking. My hope is that, if it shall appear that my objects were right in the main, and the ends I sought to accomplish justifiable in themselves, others may not be discouraged from prosecuting them with better knowledge and judgment.

Born at Brayton, Cumberland, in 1836, I had the advantage of being the son of parents who were more anxious that their children should be happy and good, than that they should be learned or great. My father (Sir Wilfrid Lawson, Bart., of Brayton), had my education conducted—in a religious manner—at home, where I acquired a little Latin and Greek, and a few other things; and where, as is the case with many other youths, anything in the shape of lessons was not attractive to me; and I learned as little as possible. I had, before I was eighteen, travelled several times on the Continent of Europe, and visited Egypt and Palestine; but circumstances never brought me much in contact with rich or great people, and I had not much of what is called “*knowledge of the World* :” nor, as I always had the prospect of wealth enough to enable me to live without working, did I form what are called “business habits.” Trained as a shooter of animals, a hunter of Cumberland beasts with hounds, and a trapper of vermin; I found myself in the spring of 1861, in my 25th year, without an occupation, without many acquaintances,—except among the poor, whom I had not learned to despise because

Gathering Information.

they spoke bad grammar and took their coats off to work :— and without the reputation of having been successful in any undertaking except that of the mastership and huntsmanship of my brother's fox-hounds. But if I had ever been a sportsman at heart, I had then ceased to be one ; and had begun to look upon hunting and shooting as barbarous cruelties that ought not to be immoderately indulged in, nor, if at all, allowed to absorb an excessive amount of time and wealth.

In 1861 we continued fox-hunting as late as May ; and on the 6th of May, having packed my saddle-bags, I mounted a pleasant little horse at the door of my father's house, with the intention of riding from there to London, to enjoy myself, and to see whatever was to be seen. I spent 33 days on the road ; going by Caldbeck, Penrith, Appleby, Leeds, Sheffield, Chatsworth, Clipstone Park, Nottingham, Leamington, Woodstock, Oxford, and Uxbridge ; visiting some old acquaintances, and making many new ones ; being shown over steel-works at Sheffield and lace-works at Nottingham ; seeing things of beauty, and finding objects of interest everywhere. Belvoir Castle was visited from Nottingham ; Stratford-on-Avon and Warwick Castle from Leamington. Many beautiful private grounds were explored on the way. And, as I was ready to talk with anybody who was willing to talk to me, I acquired a good deal of information about the various customs in the counties I passed through, and particularly about the usual rate of wages received by labourers. The highest rate of wages I met with, for ordinary country labourers, was between Leeds and Wakefield, namely, 2s. 8d. per day. The lowest rate was, I think, in Buckinghamshire. Till then I had looked upon farming as a dull business, adapted to dull people, and as consisting mainly in buying animals lean, and keeping them till they get fat : but I could not help being struck by the variety of the modes of farming practised in the different districts I passed through ; and it seemed to me that the diversities of agricultural practice could not all be satisfactorily accounted for by incidental differences, such as those of soil, climate, situation, and wages ; and that,

Gospel of Irrigation.

therefore, all was not right with agriculture. After arriving in London, I heard of Mr. Alderman Mechi's farming at Tiptree Heath, Kelvedon, Essex, and went to see it. There I thought I saw very much better crops of wheat than I had seen anywhere else on my journey from Cumberland; and I became very much interested in Mr. Mechi's system of liquid manure irrigation with iron pipes under ground, hydrants and gutta-percha hose; in his growing many crops of Italian ryegrass in the same year on the same ground; in his keeping cattle and pigs on boards; in his deep tillage, thin sowing, and high farming generally. When I returned home to Brayton, I tried, with all the enthusiasm of five-and-twenty, to impress on my father and his practical men the many and great advantages of Alderman Mechi's system of farming over the old jog-trot one; and to induce them to adopt it: but, though they listened to my gospel of irrigation by pipes and hose, they did not appear inclined to practise its doctrines; and I seemed likely to be allowed my own way *with the theory*, without bringing about any practical results. However, about October 1861, I was told that, as the Blennerhasset Farm—about a mile from Brayton—was about to become vacant, I might, if I liked, take it, and experiment upon it as I chose. This seemed a very fair offer; and though to become a real farmer, and yoke myself to a bit of ground, scarcely agreed with my previous notion of free enjoyment, I took the offer seriously into consideration. The nearness of the farm to my father's house, where I delighted to live, seemed to me very much in its favour; as did the farm itself, being in sufficiently bad condition to be capable of great improvement. I thought I should be able to work on the farm as much or as little as I liked, and so have plenty of time for reading; that I should have a good opportunity of establishing the soundness of my agricultural theories; and that I should be able to give up farming when I had had enough of it, or when circumstances might change my place of abode. Had I been differently circumstanced, my ignorance of farming might have seemed a great objection; but it seemed to me then to be of the never-go-into-water-till-you-know-how-to-

Determination to become a Farmer.

swim kind : besides, anybody could carry on what he understood, while it would require some cleverness to carry on what one did not understand.

I remember, about this time, spending some hours, during several days, in diligently going over the farm with a plan in my hand, to ascertain the depth and quality of the soil, the quality of the subsoil, and the general condition of the farm. Old "Jobby Hoddy" (Joseph Hodgson) accompanied me with a spade, and my father's head gardener with a notebook ; and we dug about three holes in each of the enclosures, —then about 40,—of the 260 acres, carefully noting the results of our observations.* The depth of the soil, we found, varied from about six inches to about two feet ; and averaged about a foot. The subsoil, generally, was gravelly. The land was what farmers call good turnip and barley land, and was well adapted for sheep-farming. Much of it was, however, very stony ; and a good deal of it wanted draining. Its inclosures were much too numerous, and its hedges too crooked and irregular.

However, I was not many weeks in deciding. The prospect of usefully distinguishing myself as an agricultural reformer out-weighed the anticipated dulness of the farmer's occupation ; and I agreed to become the Blennerhasset Farmer, my father undertaking to furnish me with the necessary capital.

The Blennerhasset estate (including mines and minerals) formerly belonged to Mr. Dawson, of Whitehaven ; of whom my father bought it for £17,100,—the manor being valued at £3,100, and the rest of the property at £14,000. The estate consisted, at the time of purchase, of 260 acres or thereabouts of land, with a water-wheel and farm buildings, some cottages, and the manor of Blennerhasset. To this was added about 73 acres of land, with farm and other buildings in the village, purchased of Mr. Robson, of Liverpool. The whole 333 acres, exclusive of all mines and minerals, were conveyed to me in one deed. I afterwards added to it the estate of

* See Appendix A.

Choosing a Head-man.

Mr. Benson, which consisted of about 87 acres. A plan of the Blennerhasset estate is given in the frontispiece.

It first became necessary for me to select, or look out for a *head man*. And, in my ignorance, I thought it more important that the person to fill this place should be a good man than that he should be a good agriculturist; so I engaged a very respectable man, who was then my father's coachman, and had been so for about twenty years; and who had, for a few years, been keeping a small grocer's shop, and tenanted a few small fields besides. I looked upon him as a good, honest man of common sense, likely to do my bidding faithfully to the best of his ability: and I do not know that I formed a wrong estimate of his character; but I think I entertained wrong ideas as to *the qualifications that were necessary* for the situation I placed him in. I had not, at that time, read Stephens' "Book of the Farm," in which I now remember that, in specifying the qualifications necessary for a shepherd, he shrewdly indicates that while the shepherd's *honesty* is important, his *knowledge of the shepherd's business* is still more so.

Before entering upon the farm, I spent several weeks in travelling, for agricultural information, in England, Scotland, and Wales; visiting many good farms and well farmed districts; calling on many eminent agriculturists, and especially giving my attention to model farm buildings: for I considered it necessary to build a new steading on my farm, and wished, of course, to have it as well arranged as possible, with all the latest improvements.

Steam cultivation came under my notice. With scarcely an atom of relevant practical knowledge, I soon arrived at the conclusion, not only that every farmer would soon be ploughing and harrowing by steam, but that so many agricultural operations would be done by this power, that farmers would, to a great extent, be able to give up keeping horses! Steam ploughing was not nearly so widely known, or so well understood then, as it is now; though I had found several sets of steam plough tackle in use in the South of England and in Scotland.

The two best-known systems of steam cultivation, at that

First Mistakes.

time, were Fowler's "direct" system;—in which a locomotive engine and a travelling anchor moved along the headlands opposite each other;—and Howard's "Roundabout" system, as it was called. And, after investigating the comparative advantages claimed for these two systems, I came to the conclusion that Fowler's would suit me best, and bought a set of his 12 H.P. tackle, price £825.

Near home a manure merchant easily induced me to buy ten tons of low-priced guano, worth very much less than I gave for it.

In due course I made some very pleasant acquaintances; and, among them, that of a clever agricultural engineer, who understood the whole subject of irrigation by pipes and hose. I brought this gentleman down to Brayton, and consulted him about my intended farming. He gave me a great deal of information and much good advice that I might have done well to follow; and said I had already made *three great mistakes*, namely, buying the steam plough, buying the low-priced guano, and engaging the coachman as my head man;—the last-named mistake being, by far, the greatest.

On the 2nd of February, 1862, I came actually into occupation of the farm, which prematurely took the name of "The Model Farm," as soon as the steam plough was introduced upon it. As soon afterwards as possible, with the able help of my father's people and others, I planned new farm buildings, with a turbine water-wheel of 20 horse-power. And how profusely I laid out money, pulling down miles of old fences; making thousands of yards of good new roads; draining the land five feet deep, and ten yards apart; and taking thousands of tons of stones out of the ground;—how, during several years, I bought and fed animals and sold them at a loss;—how I deceived myself, and was deceived by others in various ways;—can be sufficiently well imagined without being described. The figures given in this book will give some idea of these things to those who prefer details, which I shall not shrink from supplying.

In going about to get information, I had found one great

An early instance of Industrial Partnership.

difficulty common to good farmers (as well as to the other sort), namely, *the difficulty of dealing with the labourer*. It seemed to me that this difficulty was to be got over by making the labourer a direct partaker of the profits of the farm; and so I determined that my farm should be a Co-operative one. But, in those days, what were called Communistic or Socialistic ideas were not much respected, generally; and my Co-operative talk was constantly met by the well-worn saying, "If you made all the people equal to-day, they would be unequal again to-morrow." Rochdale Co-operation was not yet twenty years old; and I think the phrase "partnership of industry" had not long been invented; at least it was unknown to me. At any rate, there were not nearly so many Co-operative societies in Cumberland as there are now. Somehow I heard of Mr. Gurdon's Co-operative farms at Assington, Suffolk, and on visiting them, I found them prosperous joint-stock concerns. At Assington I found a Co-operative store, and saw a copy of the "Co-operator" newspaper.

Through reading this newspaper I afterwards made the acquaintance of its editor, Henry Pitman; and learned the history of that famous *Rochdale scheme of Co-operation*, in which, in 1844, 28 weavers subscribing small sums each, had established the principle of apportioning part of the profits of a joint-stock shop to its stock-holders, in proportion to the amount of *their respective purchases* at the shop, instead of in proportion to *their respective amounts of stock*. Co-operation then began gradually to take the leading place in my mind, and soon became the chief object of my life; so that I did not so much intend Co-operation to serve the purpose of farming, as farming to serve the purpose of Co-operation.

An account of the Assington Co-operative farms having appeared in the Royal Agricultural Society's Journal, I called about ten of my labourers together, and read it to them; and we subsequently held very many meetings on this question. I said that it seemed to me, from what information I could get in England, Scotland, and Wales, that Labour was the difficult point to deal with; that this

First Co-operative Proposals.

was evidently the great question for arrangement; and that if we could get the labourer to do right, we could then realize the greatest amount of profit from the land. I explained to them that I had in mind to give them one-tenth of the profits of my farm. I thought that when I went to the people and said I would Co-operate with them, and would divide part of my profits with them, they would jump at the offer, and we should carry all before us. But my astonishment was great when I found that they seemed to care nothing at all about it. I tried for some time;—I talked to them, but it seemed to produce no effect. I told them we would discuss the question—"Is it desirable that the workers on this farm should be direct partakers of its proceeds?" I explained to them what was the meaning of the question, and I told them something about what had been done in Suffolk, on the farms owned by Mr. Gurdon; who, as long ago as 1831, gave leave to about 30 labourers to occupy a farm as tenants; lending them money to cultivate the farm, without making them pay interest for it at first. These people had got on very well; and the farm is a joint-stock one to this day. I told my people about this, and said that in two days they should have the opportunity of voting by ballot upon the question.

Agricultural labourers are not exactly like the inhabitants of Manchester; they are not, perhaps, so independent; and they may be thought generally to speak very much as their employers would wish them to speak. However, these labourers showed independence very soon; for, when the poll was taken, they did not vote at all as they were expected. Our voting urns were two bottles. One was ticketed with the word "Co-operation," and the other bore the inscription, "Every man for himself." In stating the issue, I did not wish to make the best of my case; I wanted their unbiassed opinion. What, then, was the result with those eleven people? Actually ten of them voted for "Every man for himself;" and only one put into the "Co-operation" bottle! A year or two later another scheme was submitted to them. This plan proposed to share the proceeds, on certain specified terms. We called a public

Candid Voting.

meeting, and asked the whole of the people, whether labourers or other inhabitants of the village, if the plan should be adopted or not; and we voted by ballot. If I remember rightly, there were 53 voters; 47 voted for the plan, and 6 against it. The next thing was to bring forward a plain statement of figures, to show exactly what capital was invested in the concern; and to state clearly what I demanded as the capitalist, and what would go to them as labourers. As soon, however, as the figures were brought before them, they became dull as ditch-water; they would have nothing to do with it; they would not even come to our meetings: and, therefore, although they had already voted in favour of this plan, I said—"Well, you don't seem to care anything about it; but we will put it to the vote again." How many voted this time? Only eight!—and five of them voted in favour of the plan, and three against it. But almost all those people lived in the manager's house; so I thought very little of the result, and gave up the scheme for that year.

The next year I proposed a different plan. I did not go to the people and put it to the ballot at all; because it seemed to me that I could Co-operate with any number of people, however small; and that if the majority were against me I could co-operate with the minority. So I offered to the minority or the majority, just as they liked;—I offered Co-operation to all comers. I said—I will give one-tenth of the profits of my establishment to the workers.* Perhaps the labourers I thus consulted, seeing that I was ignorant or careless about many matters of farm practice, thought I was more likely to be wrong than right in any view I might take about the organisation of labour. It is not yet generally understood to be everybody's duty to devote his private property to the public good; still less, in those days, was it understood that anybody could be actually devoting time and attention to the business of buying and selling without having, for his main object, the increase of his own wealth. The labourers had been accustomed all their lives to have their labour dealt with by those who simply tried to

* *The Co-operator*, for June, 1866, contains a report of these proceedings, related in a speech of mine.

Want of Confidence.

buy it as cheap and sell it as dear as possible; and were, of course, unable to fall in with an entirely different order of things at a moment's notice. Seeing me engaged in buying and selling in the ordinary way, they supposed me to be prompted by the common desire to get as much as possible out of them, and give them back as little as possible; and they could not comprehend how, prompted by reasonable self-love, one might be "seeking one's own in all men's good." But if they doubted my *will* to benefit them by Co-operation, perhaps they were still more doubtful of my *ability* to do so. They saw me buying and selling, but *not getting gain*: and, under these circumstances, it was not to be wondered at if simple-minded labourers supposed that no contrivance could make my Co-operation profitable to them. Moreover, they probably considered my practice of trying experiments upon the farm a great objection to Co-operating with me. For, not only were the experiments I thought proper to have tried, expensive,—without the prospect of direct profit to myself;—but the great importance to the public of intelligently-tried agricultural experiments did not then seem to be realized by farmers generally, much less by farm labourers not at all accustomed to scientific investigation, or even to calculation of any sort. However, I felt that direct participation by the labourer in the profits of the farm would be an improvement upon the existing system of paying him by regular wages only; and I kept urging its desirability, in various ways, to various people, for several years. I saw, ultimately, that the expediency of measures was not always to be judged of by the number of people voting for or against them; and that if I approved of the principle of partnership of industry, it was for me to introduce it, and let it find its own value as time went on; and this I attempted. In May, 1866, I wrote a short letter to Mr. Pitman, which he published in *The Co-operator*, under the title of "Tithe for the Toilers." I said:—

"BRAYTON, CARLISLE, *May 13.*

"DEAR SIR,—I enclose a card which I have circulated among my workers. I have offered them one-tenth of my profits; and thus hope

Tithe for the Toilers.

to make their labour interested. I began last month to issue tickets with wages ; these tickets are to be given in on January 1, 1867, when one-tenth of the profits will be divided on them.

“I find that if, in paying, the paymaster forgets the tickets, he is soon reminded by the workers. I cannot yet see any improvement, but hope that the end of the year will show some.—I remain yours truly,
 “WILLIAM LAWSON.”

The form and kind of ticket issued were as follows :—

WILLIAM LAWSON,

CO-OPERATIVE LABOUR.

Manures.

To my Workers.

Steam Cultivation.

Flax Rettery and Scutching Mills.

I give Tickets with Wages, that you may obtain Two Shillings out of every Pound of Profit, and thus have a direct Money Interest in the success of the Establishment.

Nursery, Fruit, & Vegetable Gardens.

Seeds of all Descriptions.

WM. LAWSON.

Baggrow Station,
 Cumberland.

April, 1866.

As I stated in the letter above, though these tickets were not much believed in, that did not prevent their being taken ; and, if one was omitted to be given to the labourer, on applying for his wages, he invariably asked for it.

When the knowledge of these proceedings became public, besides many letters which I received, Mr. Gurdon of As-sington, whom I have previously mentioned, wrote as follows to the editor of the Co-operator :—“Mr. Lawson’s plan is not only an admirable way to avoid strikes, but a Christian and pleasant mode of dealing with our fellow-men.”

CHAPTER II.

A VILLAGE PARLIAMENT.

FROM the first, the Blennerhasset estate presented a good deal of activity, if it did not make much profit. About 12 acres were laid out as a market garden. Operations were also carried on at Prior Hall, another farm in my possession, consisting of 144 acres, lying eastward, about four miles up the valley of the Ellen. Besides the farming business proper, we hired out the steam plough, and carried on a manure business. In due course we manufactured flax; and established two shops, in Newcastle and Carlisle, for the disposal of the farm and garden produce.

In the early years of our establishment, while it was growing and extending itself in various ways, it was the practice to call together for consultation some of the "chief officials," as they were called—such as the head man at Blennerhasset, the gardener there, and the head man at Prior Hall. This plan seemed to work well; but afterwards, for reasons to be stated, the experiment was tried of summoning for consultation all the regular male and female labourers of the Blennerhasset farm. But I do not remember that either the last-named plan, or what was a standing offer at one time, of half-a-crown to any ordinary labourer that might give me a valuable idea, brought forward many ideas of moment from the labourers generally.

During much of the time that this enlarged council was on trial I was away from home; but I have taken the following account chiefly from the minute books of the proceedings, assisted by notes of Mr. Hunter, who was present at all these enlarged council meetings, and who generally acted as chairman of the Village Parliament during my absence.

The report of one speech, and copies of many of the

Motions in "Open Council."

earlier motions, are useful, as showing the feelings and ideas of the farm labourers.

When the co-operative offer of 1866, previously described, was made, it was thought a necessary part of the plan that the workers should, at least, be consulted as to the management of the business. Accordingly, in this year a new, and, to my mind, important feature was introduced—namely, the "Open Council," so called because it was the previous council thrown open to everybody; and the right to discuss and vote was not limited to the workers; but anyone was welcome to attend and give the benefit of his or her advice. The council was arranged to be held daily, for half an hour after dinner: but at the first meeting, on May 14th, the discussions proved so interesting that the half hour was greatly exceeded, and a Saturday meeting from 3 to 6 p.m. was soon substituted. The meetings were at first highly characteristic—the workers expressing their feelings and ideas more freely than they afterwards did, when they had learned by experience that everything could not be put to rights by passing motions. Some idea of the great interest taken in the proceedings may be gathered from the following notices of motion for the third meeting on 18th May:—

I. (By the nominal manager) "That we take into consideration the propriety of doing with fewer horses than we have now."

II. (By the same) "That the subject of the excavation of the Retteries be taken into consideration."

III. (By a labourer) "That we take into consideration whether the farm sub-bailiff is a proper person to fill his present position."

IV. (By the shepherd) "That we divide the three hours of mental toil—giving one to going over the farm, and two hours in the council."

V. (By a labourer) "That we clear our meadow of sticks and stones and tiles before the mowing season."

VI. (By the working farm-bailiff) "That, in managing the business of this establishment, we do the things in their turn that seem necessary." (When the time came on for this motion, the chairman said it was unnecessary to put it!)

A Reform Bill introduced.

VII. (By a labourer) "That the twitch be taken out of the land."

Three hours proved, of course, too short a time for the discussions that followed such resolutions; but six o'clock was tea time, and the then home attractions always proved stronger than the love of "fratching" (*i.e.* disputing).

The following proposition by one of the labourers is an indication of the *outside, after* effect of some of these discussions:—"That we consider whether it is proper for any member of council to molest at any time another member of council, in consequence of anything said in council regarding the carrying on of the business of the establishment."

This "Open Council" was really a sort of village parliament; and indeed came afterwards to be called by that name. The term naturally brought with it associations of ideas greatly in excess of our humble and limited proceedings; and when on one occasion many changes had to be proposed, the bailiff introduced them under the title of a Reform Bill! which bill produced in its way as much local excitement as the more famous measure once did in the nation. The mover made a speech upon it in which he said,—

"Every one of you who has been here for a month or two, knows as well as I do that there needs reform in several parts of this establishment; or else, as Co-operators, you are taking no interest in knowing what is going on. And, as Co-operators, both you and I ought to have our eyes open to all that is passing; how it is going on, whether profitably, or the contrary. Our meetings here prove that we believe in Co-operation; and that we expect on the first of January there will be something to divide amongst us, I mean this one-tenth of the profits. Then, I say, as Co-operators, every one of us ought to have our eyes open to every part of the establishment; and see whether, for instance (now I do not speak merely for the sake of finding fault with anybody), whether, I say, it is necessary still to employ 20 horses on the farm; whether these horses are profitably employed; whether each horseman is actually doing his duty with the pair of horses that he is working. For instance,

Clauses of the Reform Bill.

in carting stones, is the man bringing as many as he should bring? is he putting on as good a cartload as he can, or not? We should have our eyes open to these things then; and when a man goes to plough, or clod-crush, or anything; the question is, is that man doing what he can? Is it really necessary then, I ask, to keep 19 horses and a mule, to do the work that is to be done? That is a question. And then the vital question of corn to feed all these horses is to be considered. And if 13 horses can do the same work, or rather put in our crop and get stuff laid down for these rettories and buildings in Blennerhasset, so as to keep the men at work; is it necessary to employ these other 6 horses and 3, 4, or 5 men to work them? I don't know whether you have ever considered the subject; but I, having to do with the money, know what it is to pay for corn and hay and labour. We are now paying at the rate of £2,912 per annum for wages alone. Then one is demanding an increase of wages, and then another; and, supposing we give all the workers an increase of wages who ask for it, where is our profit at the end of the year? I should like to know that. Now, what I have to say is this;—and this is clause I. of my 'Reform Bill'—

“Let part of the horses at any rate be sold at once; and the rest put on half corn.”

“II. That we let alone the 8 cottages (that are, as yet, only on paper) until we see the other seven filled.

“III. That the gardener look after his own department, and that alone; and, as it is a great loss to the interests of the establishment, that he at once desist from standing over the wallers, joiners, labourers, and any one and every one who will stand and talk with him; that he go with his work-people into the garden or nursery at 7 o'clock in the morning, and remain with them until 12 o'clock; and the same thing during the working hours in the afternoon, from half-past 1 until 6. That he sell all the garden stuff himself, and do not leave it to another to do. That he sell all by ticket; *i.e.*, giving a ticket to the buyer, be the purchase ever so small, and that the buyers pay the clerk. That the clerk weigh all seeds in the gardener's possession next Monday,

Results of the Divisions.

and that afterwards the gardener give a ticket of weight and price to the buyer, and the buyer pay the clerk. The same to be done with the garden stuff, and with all seed got by the bailiffs. That the manager refuse to pay all accounts for animals, tools, garden stuffs, or implements bought by the gardener, unless he be previously acquainted with the transaction. And that after next Friday night, the gardener's pay be 20s. per week.

"IV. That the working farm bailiff never omit going into the field with his workers at 7 o'clock in the morning; and that he remain with them till the hours of labour are done; except some very urgent business connected with Mr. Lawson's interest compel him to leave. That instead of a stick he take some work tool, and, like a man, say 'Come,' instead of 'Go:' and that his wages be, after next Friday, 18s. per week.

"V. That the engineman furnish all necessary plans required at Mr. Lawson's return in two weeks, or three weeks at most; and then go and drive the engine; and let the present engineman go to some other work; and that, after the present engineman is done with the steam-engine, his wages be 16s. per week.

"VI. That every labouring man on this establishment be paid after Friday next with 15s. per week and no more.

"VII. That all women who labour either in the garden or field be paid with 1s. per day after next Friday night."*

This "Reform Bill" increased the already existing differences between the heads of the various departments. Each, too, felt uneasy; not knowing when the "fickle multitude" might vote him out. Indeed, one of them, the clerk, who was much valued by me, at once looked out for a quieter situation; and could not be induced to stay by an

* The voting on these clauses was as follows:—

| | | | | | | |
|--------|------|----|----------------------------|------|----|----------|
| Clause | I. | .. | 42 | for. | 0 | against. |
| „ | II. | .. | 22 | „ | 1 | „ |
| „ | III. | .. | 15 | „ | 0 | „ |
| „ | IV. | .. | No vote; the man resigned. | | | |
| „ | V. | .. | Agreed to. | | | |
| „ | VI. | .. | 6 | for. | 0 | against. |
| „ | VII. | .. | 7 | „ | 12 | „ |

Proceedings in Open Council.

offer of much higher pay. I was on the Continent at this time; and on my return I saw the danger of this feeling, and pointed out that the Council had only *advising* powers. Then some one would ask, "What's the good of voting? Mr. Lawson 'll not tie himself to do as we vote." To this a good answer was—"Of course not; for you might vote all my money to those present."

At this Open Council wages, as has been seen, were considered and adjusted. The chemist was questioned as to his usefulness; and one woman could not understand how, *when so many people were sick, the chemist and his drugs remained at home!*

The last meeting of the Open Council was in July, when I proposed to make the gardener farm bailiff; and this, though negatived by the Council, was afterwards carried into effect. The workers, too, were by this time tired of counselling; and were not sorry when I said that, as only the advice of those who felt an interest in the subject was of value, the meetings would be held weekly in the school, on Tuesday evenings, and not in working hours. This evening meeting remained an institution till the end. In my absence, however, the attendance, except upon very popular questions, was small, not more than a dozen being present on an average. But even two people sometimes constituted a meeting; and, on the other hand, 70 or even 100 would be present on such occasions as the proposed sale of the steam-plough, the stoppage of free schooling, or the election of a controlling agent. At first "Once a Week" was the popular and official name of this house of *commons*; but a motion "that it be called the Blennerhasset Parliament" was passed, and ultimately adopted. It met, at first, in the village school-house; but afterwards the Blennerhasset Free School-room was enlarged, and used as the place of meeting till the end.

This Parliament was virtually a *public assembly of the people*, being free and open to everybody, as has been explained; and any one was welcome to take part in its proceedings; and, by giving sufficient notice to its secretary, to bring forward almost any subject for discussion. The attendance, while free to all, was not compulsory upon the

Practical Results of the Parliament.

labourers. The secretary and a few of the chief "officials" were, however, expected to attend.

A very great variety of subjects was habitually brought forward and discussed by the assembly. Not only did it discuss farming affairs, or things over which the establishment had control, but questions of outside interest. As it was, the bargains made by the establishment, the cropping of the farm, and other matters of ordinary business, sometimes were enough to occupy the whole time of its hour and a half of deliberation on Tuesday evenings. The want of a post-office or receiving-box in the village was felt; and a resolution to that effect being passed, led to a Government Inspector making his appearance; and a receiving-box was soon afterwards established. Several Free Reading Rooms, a Free Library, the Blennerhasset Free School, and the Free Night School, were also established through the "Parliament." Through it, too, a number of Cumberland people were enabled to visit the Great Exhibition at Paris in 1867; and by means of it many of us came to know each other better, and to understand one another's circumstances much better. Of course, the funds necessary to set up and sustain the little institutions named, and the expenses of the trip to Paris, were paid out of the funds appropriated to the public good.

Sometimes petty disputes of the neighbours were introduced for discussion; and there certainly were some advantages in this system of having an appointed place for public fault-finding. For, if Jane Jones supposed herself to have a grievance against her next-door neighbour, Mary Smith, she determined to bring it before the Parliament, and gave notice of it to the secretary; for him to placard it in the village the day before the meeting! She had thus a good deal of time for reflection before getting up to state her case; and she was also likely to be tolerably temperate in her language, and to be kept pretty near the truth, in consequence of feeling that the village eye was upon her, and that the village ear was listening to her.

Often, too, when workers thought themselves aggrieved and wished to make long-winded complaints privately, it was

Reports from America.

found very convenient to refer them to the Parliament ; and happily, the greatest talkers in private life seemed, sometimes, to have least to say when called upon to speak in public.

During my absence in America I sent home letters to the controlling agent ; and as these often contained suggestions for the "Parliament," as well as information interesting to many of the labourers, they were generally read at the meetings. Among these were some passages which tell of a visit I paid to a community in New York state, which showed the results of a closer co-operation than I had attempted at Blennerhasset. As this Settlement seemed to me a remarkable one, and interested me much, I repeat here the leading features.

The community numbered about 250, about as many males as females, of various ages. They had a farm of about 520 acres, on which they conducted the businesses of grazing, corn growing, fruit growing ; preserving fruits and vegetables ; shopkeeping, silk spinning, ironfounding, steel-trap making : and the writing, editing, printing, and publication of a weekly newspaper—the *Circular*. For 34 years they had persevered, through many great difficulties, in publishing and gratuitously circulating a periodical.

About 60 acres of their land were devoted to the growth of fruits—such as apples, pears, peaches, grapes, quinces, plums, cherries, strawberries, and raspberries (red, white, and black) ; and it is amusing to hear that, though at the time I saw them they grew and sold several acres of strawberries with a great demand, they had, when they began the business, sent twelve quarts to market, and had to bring six home again !

Their silk spinning business was also a growing one. The raw silk, as it came from China, cost them about 11½ dols. per lb. ; and after they had spun and dyed it, they sold it at about half as much more per lb. Two creeks (we should call them rivers in England, each of them being considerably larger than the Ellen at Blennerhasset) ran through their property ; and they had not only steam engines, but waterwheels—one being a powerful turbine, and one a 70 horse-power, 21 ft. diameter wheel.

Social Reports from Abroad.

Their steel-trap machinery business was managed by one of their members—an expert practical trapper. They sold about 200,000 traps per annum, of six or seven sizes, from the “Great Bear Tamer” downwards. They had adapted cast steel or cast iron to the manufacture of several parts of the trap, and every other link of chain attached to the trap was cast iron. In their foundry they used pig iron from Scotland, mixed with pig iron from a place in their own State, about 15 miles off.

A considerable knowledge of chemistry and of mechanics was involved in their various businesses, and they had produced several important inventions, which, however, they did not patent; and they were liberal enough to let anybody see their works. They had 58 milch cows, some of them pure-bred Ayrshires. They employed many hired people (“helps,” as Americans call them). A first-class English labourer had 37 dols. a month of 26 working days, and constant work; his English wife was paid 1 dol. (about 4s.) per day when she hoed the strawberries. She had adopted the same short dress and trowser costume that all the women of the Community wore, as she could thus do more work with greater comfort than with the old-fashioned long dress.

They had about 150 acres of grazing land, of which about 2 acres will support a cow. They did not grow wheat usually; or hops—though hops were grown a good deal in the neighbourhood, and said to yield 150 dols. per acre on an average. They grew from 25 to 30 bushels of barley to the acre; 50 bushels of Indian corn; 2 tons of hay; 150 bushels of potatoes (60 lbs. to the bushel), or about 4 tons.

Everybody laboured with his hands, and everybody (of whatever age) was a student. The clerking, printing, and editing, were done by the female members of the Community. Some of the “helps” worked ten hours a-day, and some eight; but the members usually worked not more than eight hours in summer, and four in winter. One man—who had been crippled by a tree falling upon him while working at the clearing of the farm in its early days—had become a good shorthand writer and reporter. These people usually had three meals a-day—at 6 a.m., mid-day,

Social Criticism at Blennerhasset.

and 6 p.m.—and they ate scarcely any fish or flesh, but lived very much upon a great variety of fruits, and of farinaceous and vegetable food.

Among these hundreds of Communists there was a great diversity of talent, disposition, and education. They had no private property, but all things in common. They had meetings every evening in their great hall, for hearing news read, and also for conversation. Sometimes they had concerts and theatrical performances; or lectures on "Chemistry," illustrated by experiments. On one of the principals asking for *criticism* of himself, about a dozen male and female members of the community talked about him, one after the other, for half an hour; commending his good, and condemning his bad qualities. This *criticism* was very highly valued as a means of keeping the members on their good behaviour and in good humour. The whole party seemed to lead a blameless, industrious, contented, and useful life. Intensely theological and scriptural, and enthusiastically Christian, they founded their practice on their theology; of which one of the vital points was the doctrine that what they call "Christ's second coming" took place at the destruction of Jerusalem, A.D. 70. They looked for God's will to be "done in earth as it is in heaven," where they "neither marry nor are given in marriage." However, they did not object to marriage "for people in the world." In their school were 19 remarkably bright and happy-looking little children.

Incited, perhaps, by the criticising feature above mentioned, it came about during the latter days of our Parliament, that it instituted a system of mutual criticism, by which whoever chose might be publicly criticised by the Parliament; and have deliberately pointed out the supposed good or bad traits in his character, as the case might be, with suggestions or advice for his future guidance. There was freedom of speech not only in name but in reality; and occasionally the cool and pointed way in which workpeople of the establishment criticised those who were "in authority over them" was diverting, but might have been otherwise but for the quiet way in which those criticised "stood fire."

The Prior Hall Estate.

CHAPTER III.

FARM PROCEEDINGS—OUTSIDE OPINION.

As in the early years of farming I thought I was doing famously, I was glad of any opportunity of extending my operations; and as my father had conveyed the Prior Hall Estate to me, I wished to farm it myself; for I did not wish to be the owner of any land without occupying it.

The Prior Hall Estate, as I have said, was situated about four miles from Blennerhasset, on the same side of the river Ellen, but higher up the valley. It consisted of about 146 acres of stronger and better land than that of Blennerhasset, but was in a colder climate. It was almost all arable; and had a good, new, centrally-situated farm steading, with a water-power threshing machine. It was occupied by a good tenant, who had held it, under various landlords, for many years. I paid him £545 13s. 1d. for unexhausted improvements, &c., and took the farm into my own hands on the 2nd of February, 1865. The rent of the farm had previously been £221.

I engaged, as farm bailiff for Prior Hall, a good Scotch husbandman, who remained with me as long as I farmed at all, namely, till 2nd February, 1872; and I had great pleasure in this farm while I occupied it; for, whether I made money by it or not, I easily had my own way in the management of it.

Among my recollections of Prior Hall are the pleasant walk of over ten miles that each visit to it usually gave me; also the deep steam cultivation and heavy bone-manuring done there; success in growing a fine crop of drum-head cabbages; and failure in growing onions. Success in this latter crop was much sought after, but always in vain till 1870, when a few acres at Blennerhasset did result in a splendid crop; but then the labour of weeding, of sorting and re-sorting, and the rapid decay of many of the onions

Harvest Homes in the Vale of Ellen.

that year, made our success in growing, a failure in paying. The estimated profit from this crop had been £59 17s. 6d. per acre. In 1867 we had seven acres at Prior Hall prepared for onions. For that year there is still in existence a paper dated Feb. 6th, 1867, and headed "Estimated Profits on the Prior Hall Farm for 1867." The chief features of it are:—

| | | |
|--|-----------------------------|------------------|
| Cabbages, 26 Acres.. | Profit per Acre, £18 0 6... | Total, £468 13 0 |
| Onions, 7 " .. " " " | 59 17 6... | " 419 2 6 |
| Leeks, 6 " .. " " " | 76 7 6... | " 458 5 0 |
| Carrots, 4 " .. " " " | 28 18 4... | " 115 13 4 |
| The profit on 95 Acres of the remainder was to be..... | | 692 16 6 |

Total profit on 136 Acres.....2,154 10 4

The actual result that year, however, was a loss of £252, without taking into account any charge for rent or interest.

Prior Hall was not so much of a "sight" for strangers as Blennerhasset Farm; the steading being more after the usual pattern. A brief account of some of it will be found in the *Journal of the Royal Agricultural Society of England for 1867*; where, in connection with the steam cultivation reports, Professor Coleman remarks upon the soil and tillage of Prior Hall.

Its harvest homes were locally celebrated. An account of that of 1867 appeared in the *Wigton Advertiser* of October 19th. It was written, probably, by the then schoolmaster of Ireby; and is interesting as being an *outside* view of the affair. The writer stated that these annual gatherings were originally intended to celebrate "the ingathering of the harvest, and to afford to the numerous workpeople on the Prior Hall Estate an opportunity of enjoying, in company with their friends, an evening of rational social entertainment. But, so open and so pleasurable have been the meetings, that the night of the Prior Hall harvest home is now considered a general 'gala night' by the whole vale of Ellen. The numerous guests, upwards of 280, arrived in time to partake of an excellent tea provided in the large new granary. The room had been uniquely decorated; tastefully arranged devices, formed from products of the farm, such as cabbages, carrots, parsley, flax, wheat, and

Sale of Four Estates.

oats, adorning the walls. After tea several arrivals in carriages, and many more on foot, so increased the number of guests, that those in attendance during the greater part of the evening could not fall much short of 400. Some ladies, and many wives and daughters of labourers and others were among them." I was abroad then; and, of course, was glad to learn how pleasantly the time passed.

In June, 1867, there came into my possession the two farms adjoining Prior Hall, namely, Park House, of about 275 acres, and a rental of £318; and Newbegin, of about 150 acres, and a rental of £176; also, the distant estate called Littlethwaite, in the vale of Lorton, consisting of 140 acres of woodland and farming land, the latter portion being let for £65 a-year. This last estate I sold by auction, at Cockermouth, on 14th October, 1867, for £3,010.

About this time also I bought the Prior Hall Mill Estate, and at Candlemas, 1868, laid it to the Prior Hall and other two adjacent estates. It consisted of a water-power corn-mill, some houses, and about 13 acres of land; the price paid for it was £1,350.

With the view of occupying all these four estates—about 584 acres—I proceeded to buy the leases of the tenants of Park House and Newbegin, and to pull down some of the fences. Nevertheless, I afterwards thought it prudent to offer all the four estates for sale; and accordingly, I sold them by auction, at Carlisle, on 25th January, 1868, for £28,600;—giving possession on 2nd February, 1868. The only farming land then left was that at Blennerhasset, for which my capital was more than sufficient.

In the early part of 1868, as I had the prospect of travelling extensively, and of being, for a good while to come, even less about my farm than I had hitherto been; it was evidently desirable to appoint a trusty and capable person to act as controlling agent during my absence; and I decided to consult my neighbours as to who should be so appointed. Accordingly, a day and hour were fixed for the nomination, in the Blennerhasset Free School-Room, of candidates for the new office. Everybody was welcome to attend the nomination, and to nominate any one. Three candidates,

Election of a Controlling Agent.

all of them Scotchmen, were nominated. One was our Blennerhasset farm chemist ; another the gardener, who had been recently acting as the Blennerhasset farm manager ; and the remaining one was the head man of the Prior Hall Farm.

The polling was fixed to take place in the same room at a particular hour, a few evenings after the nomination. All comers, except very young children, were allowed to vote ; and the voting was by ballot. The chemist withdrew before the polling commenced ; so the contest lay between the two Scotchmen of Blennerhasset and Prior Hall. The result was that the Prior Hall candidate received 88 votes, and the Blennerhasset one 24. Majority for the Prior Hall Scotchman, 64 votes. The successful candidate was soon afterwards formally appointed controlling agent, and publicly charged to do his duty.

The Blennerhasset farm had, naturally, many visitors ; some from mere curiosity, others to see our farming, and a few to learn about our Co-operation. An account of the place was written by a visitor from Newcastle ; and its appearance in the "Co-operator" of August 1st, 1867, took us a little by surprise. It was made the subject of some sharp and adverse criticism by the weekly Parliament, the title of "A Co-operative Farm" being specially objected to. And, perhaps, there was at that time some ground for this objection ; for, after our non-success in 1866, the offer of a bonus on labour was not renewed till 1870 ; and the system in force for 1867, was a promise "that all the declared profits over 2½ per cent. (the only interest), would be devoted to public uses"—named by us the "Public Good." The writer referred to gave, among other things not necessary to recall now, some particulars which may be relevant in this place. He said.—

"Blennerhasset Farm, originally known as the 'Mechi' Farm, is situate somewhat within a quarter of a mile of the Baggrow station, on the Bolton branch of the Maryport and Carlisle Railway, and a few hundred yards westward of Blennerhasset village. The estate formerly belonged to the Dawsons of Whitehaven, and was for a considerable period

A Visitor's Report.

farmed by the Pirt family—excellent old-fashioned farmers, who retired some years ago with a competency. Crossing the massive stone bridge over the river Ellen, which separates the village of Baggrow from that of Blennerhasset, a short walk brought us to a little rivulet at the west end. Passing along a small foot-bridge, we found ourselves in the winding lane leading to Blennerhasset Farm, and in a short time reached the homestead. Mr. Lawson being absent, Mr. Hunter obligingly offered to conduct us through the farm buildings.

“Shown into the Laboratory—a large room, well stored round with bottles of chemicals—Mr. Hunter showed us some interesting experiments, and produced the wonderful and beautiful magnesium light. We were also shown a small printing-press, used for the printing of circulars and price lists; and the Free Library of 400 volumes of standard literature, for the use of the villagers and the employés on the farm. Not only is it stored with excellent works in general literature, but it contains some strongly evangelical writings; and other works, as Francis Newman's ‘Phases of Faith,’ Harriet Martineau's ‘Household Education,’ and ‘Felix Holt, the Radical,’ in 3 vols. Mr. Lawson is about to establish a ‘Working Men's Club’ in the village; and has also under consideration a somewhat extensive scheme of free education for the children of his employés and poor children in the neighbourhood.

“The byres were judiciously planned, roomy, and well ventilated. The stables were even roomier and better ventilated than the byres. The farm horses, which displayed that bone and muscle so necessary for agricultural work, particularly charmed us by their fine condition and sleek coats. Each animal was neatly ‘bedded up’; and general good order seemed to pervade the ‘horse repository.’

“We next inspected several crushing, grinding, and grass and straw cutting machines; the straw-house; the scutching mill for the dressing of flax, which, we may here observe, is largely cultivated on the farm. Before undergoing the scutching process, the flax lies for a considerable time in water tanks, in order to make the rind come off the more easily.

Manufactures Conducted.

These tanks are very large, and are situate a short distance eastward of the farm buildings. The flax, after undergoing the scutching process, is sent off in quantities to a large manufactory at Egremont, near Whitehaven. The flax-seed also finds a ready sale for the purpose of being manufactured into 'cattle food.' In the flax mill we met with a genuine son of the Emerald Isle, who was introduced to us as the manager of the scutching mill, and a 'brother vegetarian.' It was the original intention of the projector of the Cumberland Co-operative Farm that *all* the employés should be vegetarians; but at the present time, owing, it is said, to the peasants' aversion to a food of fruits, there are but three of the 'pure faith' on the estate—viz., Mr. Lawson himself, Mr. Hunter, and the Hibernian.

"On the north of the scutching mill are two immense tanks for the holding of the liquid manure, which is conveyed by means of pipes from the stables, byres, and feeding stalls. From the tanks it is forced through pipes to different points on the farm. We went also to the gas manufactory, where gas is manufactured not only for the use of the farm, but also for a great part of the village; and Mr. Lawson contemplates supplying the whole of Blennerhasset and the adjacent village of Baggrow. The old homestead, formerly occupied by the Pirt family, is altered. The old barn has been modernised, and converted into a chemical manure manufactory. Mr. Lawson is especially careful to win the confidence of the Cumberland farmers in his manures. Any sceptical agriculturist may visit the works, and learn what are the component parts of these manures, which are manufactured under the special superintendence of an analytical chemist. Around the new farmstead fine young plantations and orchards, shrubberies and flower gardens are fast springing up. Mr. Lawson has a steam plough on the farm. We were told that 'sub-soiling' had been largely practised; and we know that some of the old farmers shake their heads, and say that it has made the land 'cold.'

"Before leaving the village we visited the new Co-operative Stores, which are just in course of formation. The sign above the shop door had the simple words—'William Lawson,

Rustic Debates.

Licensed Dealer in Tea and Tobacco.' It was unpretentious in style, having white letters on a black ground. A larger and more important-looking sign—gold letters on a brown ground—was being painted for the gable-end of the shop, and will be readable from a great distance. The wording of this sign was somewhat novel—'The Snuff Shop and General Mart.' In the shop window we observed a motley group of saleables—seeds of various kinds, specimens of manures, crushed bones, mint lozenges, note paper, and envelopes.

"Weekly meetings for the 'open' discussion of agricultural topics, social and educational questions, and matters of finance are held, by permission of the teacher (Mr. Sharp), in the village school-house, and under Mr. Lawson's presidency. These discussions are exceedingly animated, and must be productive of a sharpening of the intellects of those who take part in them. Until of recent years, anything like discussion was totally unknown in the Cumberland villages; and it augurs well for the future of the agricultural population of the North of England when men of spirit like Mr. Lawson, content to become the subjects of remark and criticism by those who deprecate all innovation, thus leave the beaten tracks of their forefathers, and establish Model Farms, Co-operative Stores, Working Men's Clubs, Free Libraries, and Village Discussion Societies."

The preceding extracts imply that certain agricultural manufactures were proceeding, and contain an allusion to "Cain and Abel," which will be more intelligible if I introduce here a chapter written by Mr. Miller Tiffin upon our Steam Plough, the first ever introduced into Cumberland. Mr. Tiffin, having been in charge of it, can relate more facts about it than myself.

CHAPTER IV.

THE FIRST STEAM PLOUGH IN CUMBERLAND—
ITS ADVENTURES AND VICISSITUDES.

IT certainly was a misunderstanding of the celebrated engineer who, when consulted by Mr. Lawson, said that the steam plough was one of the three great mistakes made by him in commencing his model farm; for it is very questionable if the Free Co-operative Farm would ever have existed had the steam plough not led the way; and it is still more questionable if steam cultivation would have attained to its present advancement in Cumberland but for some one to pioneer it, and to persevere through losses and crosses, dangers and difficulties, till it should prove at last successful, and become an accepted fact.

Early in February, 1862, No. 95 of Fowler's Patent Steam Ploughing Tackle arrived at Aspatria Station; and on the day after its arrival, the locomotive and traffic superintendents, with several workmen, came with a travelling crane, and many screw-jacks, to unload the engine; which, though it seemed a great and a difficult work, was soon safely accomplished.

A man having been sent from the Steam Plough Works to start the tackle and instruct the new hands, steam was soon raised, and amidst the intense excitement of a large crowd, the engine—self-propelled—started on its journey to Brayton. The multitude were astonished when they saw that the engine could travel without the aid of horses; but the prophets opened their mouths and said, "She'll nivver get up Thomson's Brow." But the sanguine ones said, "Ah! but perhaps she will." Thomson's Brow, a stiff incline of a few hundred yards

Progress of the Plough.

in length, was, in fact, soon climbed, and the engine fairly landed in the village of Aspatria. "Well," said the prophets, "she's gotten up; but she'll nivver pleugh!" She proceeded through Aspatria amidst the gaze of the rustic population, and safely reached the farm at Brayton, where it had been arranged we should make our first attempt at cultivation. She had travelled well on the hard road; but it was different now when she got on a lea headland, too slippery from the wintry rains for the wheels to grip. She plunged and mired, and mired and plunged; till, unable by ordinary means to extricate herself, she was left in an ignominious condition for the night. Early next morning, a nice inclined plane was dug before the wheels, and a snatch block fixed a few yards a-head, round which a rope was carried; and by arranging this in a certain manner, such an increase of leverage was obtained that the engine was soon out of her difficult position.

With this, the first misfortune, the first repairs became necessary. In trying to move her, when she mired, the steam had been given out suddenly and forcibly, on the principle of serious diseases requiring desperate remedies. A connecting shaft was thereby bent, and the key fixing the driving wheel to its axle tore open its bed: the shaft had, in consequence, to be sent to a foundry to get straightened; and a new key to be made.

Thus commenced a series of mishaps, misfortunes, breakages, and repairs, that grew and expanded to a magnitude such as ultimately to justify the prophets, who, in a moment of exultation, declared, on this first day of action, "She got up Thomson's Brow, an' she's pleughing; but she'll *never* pay."

At twenty minutes past eleven o'clock in the morning, on Wednesday, the 12th February, 1862, the first furrow in Cumberland by steam power was turned in the Flower Garden Field at Brayton.

When the plough had made its first journey across the field, the ploughman looked to see his furrows, but none were there;—such a host of professionals and sundries had followed, that the furrows had disappeared beneath their

The Engine and Anchor System.

tread. By-and-bye, however, as curiosity got satisfied, the work appeared, and was pronounced excellent by those who knew their business.

In about 5 days we had ploughed as much as we could of this our first field; for we could not get into the nooks and corners. In those 5 days we had ploughed about 18 acres. One skyfe, value 9s. 6d., and 18 shares, value £1 2s. 6d., had already been broken, though the field was considered comparatively clear of stones. The skyfes and shares were made of cast-iron, and usually gave way first;—as, owing to the great weight of the plough, something must needs give way when it came in contact with an earthfast stone. So, while it was apparent that every part should be strong enough to resist the power of the engine to break it, in ordinary working, it soon became plain that socs and skyfes were not so.

The system with which we hoped to show the great superiority of steam over animal power for cultivation of the soil, was the single engine and anchor system, in which the engine, being self-propelling, travelled along one headland, and the anchor along the other. The engine was put alternately into travelling gear and ploughing gear according as she was herself advancing along the headland or moving the implement. An endless rope passed round the clip-drum, and round the sheave-wheel of the anchor; and was also wound on two separate slack-gear drums on the plough. It was necessary to keep this rope tight on the clip-drum of the engine; and the slack-gear was so arranged that one-fifth of the power applied to one drum in pulling the plough along, was, by means of a chain-belt, transmitted to the other; and by this means the slack-rope was wound up, and kept moderately tight behind the plough. This system did not admit of the plough's being turned at the headlands; so it had two sets of moulds opposite to each other; one set ploughed in going from the engine, and the other in returning.

The framing of the plough was supported on two wheels at its middle; and was so bent at that part that when one end was in the ground ploughing, the other was in the

Other Systems Appear.

air doing nothing. Hence it was called a Balance Plough. The grubber was also similarly a balance implement.

The engine first pulled the implement to the opposite end of the field,—the anchor resisting the immense strain upon it by having four disc wheels about six inches in the ground. When at the anchor end of the field, the end of the plough in the air was pulled down, and, of course, the other went up; and the plough then moved towards the engine. While doing so, a break was tightened on the anchor, and it wound itself forward by means of a wire rope fixed to a crab some distance ahead. When moved far enough for two breadths of the implement, the break was slackened till required to move forward again.

Soon after we had commenced steam cultivation, however, another system, called "the double engine system," was patented by Savory, of Gloucester, which at once appeared a step in advance of ours. Each engine travelled along opposite headlands, and the cultivating implement was pulled towards each end alternately, by means of a steel wire rope, and a winding drum. This drum in Savory's plan encircled the boiler, but in Fowler's system was placed horizontally underneath it. Savory's system had the merit of having the least possible quantity of rope in use at one time across the field; and of having the least possible number of implements to move from field to field. Usually only one horse was required, and that to supply the engines with water, when travelling or cultivating.

We had got our first field ploughed with our engine and anchor system; and for the first time the whole tackle was to be lifted, packed up, and removed to another field; to be there unpacked, and set down again. This turned out to be always a serious business: the wire ropes—many hundreds of yards in all—were to be cleared off certain drums, and coiled up, or wound on another drum attached to the engine for the purpose; the anchor was to shift, so as to mount it on a pair of travelling wheels, and two horses to yoke to it; a mould board to be taken off the plough, and a pair of ill-contrived shafts to attach to it, in order to yoke a horse to

Burying the "Old Man."

it; the "rope-porters" to collect together and attach to the water cart; and another horse to go with a cart and collect all the odds and ends together. In this manner a time, varying from one to four hours,—as circumstances were favourable or otherwise,—was usually consumed in making ready for a start. The engine was generally easy to start in removals; but, almost always, the horses in the anchor either wouldn't or couldn't at first pull together; and not until after a good deal of coaxing, shouting, and cracking of whips, was it got in motion. Sometimes the horses had to be changed, and others put in their places.

On first arriving at a field, an examination took place as to the best headlands for the engine and anchor respectively. This decided, the engine was placed in position; and was generally ready first. The plough was then set down near the engine; and while the ploughman was preparing it, another man was placing the porters in position for supporting the rope; another digging a hole for the *old man*; (said "old man" being a lap of straw with a strong piece of wood through its middle, and a chain encircling it to receive the headland rope to prevent the pulling forward of the anchor). This *anchor of the anchor* used to be buried from two to three feet deep, so as to offer resistance enough. Another man took the travelling wheels off the anchor, and prepared for lowering it on its disc wheels. By this time the drum rope had been drawn across the field from the engine by the water-cart horse, and was waiting till the anchor was down, to get the rope round the sheave wheel. When as much rope had been paid out as was required to make the endless rope complete, the ends were wound on their respective slack-gear drums, and the rope put round the clip-drum, and we were ready for a start.

We soon learnt that the anchor was to be the great source of trouble, danger, difficulty, and loss of time and temper. When it was on a fallow headland (and we had too many such) its grip of the ground was not so great as that of the plough or grubber; and when the power was applied, instead of the plough moving to the anchor, the anchor often moved towards the plough. We soon got a large box made, put it

Lessons in Perseverance.

on the anchor, and filled it with two cartloads of stones to increase its stability; but after all we could do, it would often drag, and had again to be cleared, lifted, and set down afresh; affording rich opportunities of teaching ourselves to be patient. Sometimes, after being five or six weary and tormenting hours in getting ready, and when the anchor held its grip, the "old man" would slowly and solemnly come out of his grave, head first; not having been sunk deep enough to hold against the pull of the anchor. Another half hour was then lost in making another and deeper hole for him. It seemed strange that it should be so difficult to successfully apply steam power to the apparently very simple and primitive operation of drawing an implement to one side of a field, and then bringing it back again.

However, we got our first removal accomplished; and found ourselves first trying to plough, then to scarify, and then to dig; having different parts for attachment to the plough frame, for performing these different operations. But here we found that cultivating a fallow field in the month of February did not answer; and after working a part of two days, and breaking £1 12s. 6d. worth of skyfes and shares, we packed up our tackle and went to the Blennerhasset Farm. Here our first field was only a short distance from the roadside; but having a steep incline to travel, the engine stuck; a dark prospect for us when we remembered there was scarcely one really level field on the farm. We next cleared a road for the wheels, made it up with stones, and got her placed in Langlands, a field of 10 acres, and one that seemed actually *paved with stones*, many of them being large earth-fast boulders. We managed to plough these 10 acres in 6½ days, one of which, however, was spent in washing out the engine, and repairing a mud hole in the fire-box. We broke three skyfes and 21 shares, costing £2 13s. 9d.; and, when we had finished, we discovered that we had ploughed the first field on the Blennerhasset Farm at a cost of *very nearly a pound per acre*; including, of course, wear and tear of tackle. This certainly was not a hopeful beginning; but we *had* made a beginning; and that was something. We subsequently ploughed two other fields at much

We begin at Home.

the same rate and cost. Had the land been clear of stones, as they manage to have it at Royal Show trials, we could easily have ploughed six acres a day; and by so doing we could at once have paid our way. As it was, I think much of the loss appearing in our early steam plough balance sheets ought to have been charged against land improvements—as for taking out stones:—for the grubber itself pulled cartloads to the surface without the aid of pick or spade. Judging from this, many of the self-wise men declared that the land should have been cleared before the advent of the steam plough; forgetting that it was only its actual presence that showed us the necessity of getting the stones out.

Commencing, as Mr. Lawson did, with great confidence in the principles of co-operation and interested labour, those principles were early applied to the steam plough work; for so early as March 6, 1862, I learn from my diary that it was determined on that day to give the anchor man 6d. per week extra, over and above his wages, for his meritorious conduct in digging out stones—the porter boy 1d. per acre for managing the porters himself; and the stone marker $\frac{1}{2}$ d. per cartload.

We had a boy going with a bundle of sticks; and wherever the plough struck a stone, a stick was placed; which made the fields often look like plantations, and guided the stone-diggers to their work.

We had not worked two months till we became aware of that great defect of the system—the unfortunate failing that afterwards kept us in daily terror—the dragging of the anchor. We had just got it put right after its first deviation when—as misfortunes never come singly,—the slack gear clutches began to slip; and when these had been made to hold, the anchor in its turn began again to drag. We were almost in despair; but we had already adopted a line of action that was to overcome many a seeming impossibility;—“Never despair; try again.” Going a second time to Brayton, a new source of detention presented itself,—we ran short of water. Indeed, one fresh obstacle followed so hard upon another, that it seemed as if we were labouring under a spell. Under this last-named difficulty it sometimes happened that,

Accumulated Misadventures.

as all the ditches and brooks were dried up, a long journey had to be taken by the water-cart man for a supply.

By this time the slack gear clutches had become intolerable. We took them off, and had them repaired, and put on again. We had just started afresh when the rope slipped off the drum, and jammed itself amongst the clutches. This was righted; and so we continued—breaking skyfes and shares—till, one day in April, the keys in the shaft communicating the power to the clip drum were forced from their places, from having been let in too shallow at first; and we were at a stand-still once more. While engaged in repairing the keys we got marching orders to go to Mr. William Norman's farm at Oughterside, a place four miles distant. In the meantime a seven-tined grubber had been ordered from the Steam Plough Works at Leeds; and having come to Aspatria Station, it was taken right on to Oughterside. We had advertised to work for hire, and this was our first engagement.

Commencing to grub crosswise a somewhat dirty field, the tines of the grubber soon choked up; every now and then it had to be drawn back to clean itself; and we found the tines were not shapen properly for drawing themselves into the ground again. Our work proved far from first rate. That portion of the power applied which was transmitted to wind up the slack rope behind the grubber,—owing to the length of the field, the roughness of its surface, and shallowness of our work,—was not sufficient to keep taut the slack rope; and it fell down in coils beside the engine as it was paid out from the clip drum. One of the drums was bared by this means; and the rope had to be dragged in stages, by hand, round the field, and to be wound on by hand; and then after going about twice across the field with the grubber the hand-winding was all to do over again. This was dreadful work, alike to us and our employer.

We thought it time to try improvements; and altered first the shape of the tines. They now went deeper into the ground, and did better work; causing also the slack rope to be kept taut without hand labour. We removed to another field, where the headlands had been ploughed; and here again the anchor dragged. A man was then engaged to drive

Further Troubles : Job's Comforters.

posts before one of the disc wheels to hold it ; this answered for one day ; but next day the strain tore the axle off the anchor altogether, leaving us helpless again. This was repaired ; and, being determined to grub the field, we cleared away the loose earth to a depth of nine inches from before the anchor, to give it solid ground for travelling ; it was no better, however ; we only got ten square yards grubbed that forenoon !

In these our early days we never lacked plenty of visitors. Some came to pity and sympathise with us, and others to enjoy our struggles with misfortunes. Advice was, of course, plentiful,—and generally useless ; and “ Job's comforters ” were many : but none of them could show us *how to tether our anchor*. Our newly engaged anchor man, who had been a sailor and had observed a good deal, said, “ Let us bury an old man, and that will hold it.” It was here, then, we buried our first old man, in the manner previously described. A farmer—who always gave us much useless advice—said, “ If that hods't, a'll eat my hat ! ” It *did* hold it, however.

Having at last finished the field, we had got packed up ready to leave, when Mr. Lawson appeared, and gave orders for the anchor to be loaded with odds and ends, for the engine to draw home. It was a weary journey ; the anchor was mounted only on two wheels ; and, being fastened to the engine with a chain, it reeled and rocked like a drunken man the whole way home. We “ tore away ” home, however, for it was always a point with us *never to give up*.

As an instance of Mr. Lawson's own zeal in scientific cultivation, I find from my diary that our ploughman did not turn up on May 13th, 1862, that Mr. Lawson consequently drove the engine, and the engineman took the ploughman's place.

By this time many of the old, broad, crooked hedges of the Blennerhasset Farm had been thrown down ; and, as steam was the proper source where great power was required, grubbing up hedgerows, amongst tree roots and stones, was thought the very job for us : so we made our second start at home, on perhaps as rough a farm as ever witnessed steam cultivation. We seldom grubbed a field at this time without crossing one or more hedgerows and gutters ; and

Cultivating Deeply without Socs.

thereby bending tines, breaking socs, and straining the grubber far beyond what it was constructed to bear.

We broke so many socs (at eightpence a-piece) that,—Leeds being too far to go for them, and the Foundry at Carlisle not supplying them fast enough,—we tried to grub without them. The anchor having a good, firm headland, we got on wonderfully; but did little good to the land, spoiled the tine points for again receiving socs till they should be repaired, and had experience enough in one day's work to make us for ever after abandon the idea of trying to cultivate without socs. Shortly after this we tried stitching by steam. Taking the tines out of the grubber, we attached a pair of stitching moulds to each end, converting it into a stitching plough. This was light work, affording no scope for the power of the engine; and was given up as an operation in which there was more pride than profit.

After cultivating one more field, the tackle was brought home till the crops should be gathered, and we could commence that desirable farming operation, autumn cultivation. During the recess, I visited the steam cultivating trials at Farningham, Kent, in connection with the Royal Agricultural Society; and viewed with much interest the different systems at work under the most favourable circumstances. From what I saw there I was convinced that, notwithstanding the working defections (for in theory there were none) of the clip-drum, slack gear, and anchor system, it was undoubtedly the best, and by far the strongest, in its construction. Any other of the tackle I saw would have been made into scrap-iron in about a fortnight on the Blennerhasset Farm. But all the circumstances at these trials were widely different from ours; instead of the month of February, with hedgerows and stones, and soft slippery headlands, they had fine dry weather in July, with the headlands level and stiff, and in fine condition for travelling. The land to be cultivated was level, dry, clear of stones, and in a friable state: and, the tackle being all new,—of the best material, and in the best working order,—there was never a stop or break; for there was nothing to cause either. It would have been strange if, under these circumstances, steam cultivation had

Cultivating the Heads, and Improving the Anchor.

not appeared to great advantage, and if Fowler had *not* grubbed at the rate of 16 acres a-day with his seven-tined grubber, though we in our stony Arabia could only average $4\frac{1}{4}$ daily.

On my coming home, we received orders to cultivate the Heads—the ugliest and awkwardest field for cultivation on the farm, if not in the county. It was in fact a miniature Skiddaw. Upon successfully finishing this field, we were confident we could cultivate anything. Having, however, some time on our hands before the crops would be off the ground, we thought of making improvements. As the anchor could only move forward when the grubber was on its return journey, it happened that in short fields it did not get moved far enough. So we got some new cog gearing to make it travel at double its old speed. We also had two of the four discs replaced by others of 3 feet diameter, to give it more holding power. This was a decided improvement. Fowler had also by this time improved his clip-drum; and, as ours was very faulty, we made an exchange; and so found ourselves in a tolerably decent position when we commenced on September 8th with autumn cultivation, to which great importance was attached, and which proved to be a very useful operation. For, after autumn work, it only required one grubbing in the spring to make the land ready for turnips.

A journey was next made to work for hire at Silloth, a distance of twelve miles. The engine was used to convey thither as much as possible, including the anchor and grubber; but as no apparatus for attaching them to one another had been supplied, we had to fasten them as best we could, and often had to stop on the way and adjust, and fix afresh. We found at Silloth a fine, big, level field of hard clayey soil to grub; where it took all the power of the engine, straining the tackle to the utmost, to get six or seven inches deep. As we could not afford to use less than seven tines, to get a passable quantity done, our work was not so satisfactory as if we had used fewer tines and gone deeper. The boiler pump proved also a source of stoppage, owing to some sand being in the water; and eventually, when we had

To Silloth and Back—the Anchor Run Over.

just begun to “cross” the field, at 5 P.M.,—by mutual agreement between Mr. Lawson and the hirer,—we packed up to come home! It was well; for rain set in, and we just got out of the field in time. On reaching the top of Hayton brow on our homeward journey, the engine was stopped till water should be pumped into the boiler: but the vibration, together with the weight of the anchor behind, caused the engine to run backwards; the anchor, too, swerved right across, and in another instant was lying flat on the road,— $1\frac{1}{2}$ tons in weight,—with 23 of its 24 wheel-spokes broken to splinters. A crowd gathered. We put it to one side, and proceeded onwards; and in the dead hour of the night, when the good people of Blennerhasset thought us at Silloth, the shrill scream of the whistle roused them from their slumbers.

We had not worked long, after this, till an axle broke belonging to one of the larger discs of the anchor. It became plain that the tackle was too weak generally; for as we strengthened one place, another gave way; and well might I write, as I did, in my diary at this time, “I have no hesitation in saying that ours is the most unfortunate set of tackle Fowler has sent out from his works at Leeds;” and also, the day after, “Broke anchor-rope twice to-day; ‘old man’ lifted out of his hole; very bad luck.” But our difficulties with the anchor were not past yet: the screw used in its forward-motion gear refused to tighten the break, and had to be sent to Carlisle for repairs. On October 24, also, we required to get a new engine travelling slant-shaft from Leeds, the old one being only a 10-horse shaft, whereas our engine was 12-horse power. During November and December we tried to stitch, to grub, and to dig. The weather was, however, against us; and in digging we broke a great many socs, costing fifteen-pence a-piece,—no less than 18 having got broken in one day, while doing $1\frac{1}{2}$ acres. Fifteen shillings an acre for broken socs was a little too costly! Digging was, however, a splendid operation, especially on clayey land. But very soon the ropes were coiled up and the engine left till better weather should favour us.

Poets Appear.

Mr. Lawson, being a member of the Wigton Farmers' Club, agreed about this time to read a paper there on steam cultivation. On February 13th, 1863, a rhymed lecture arrived by post, ready written to his hand. Parts of it set forth in graphic terms the experience so far related. Having "bought and brought" the plough down, the verses set forth:—

* * * * *

Full soon we set the plough to work;
It went at lightning speed.

The porter lads with vigour ran,
The whistle shriek'd aloud,
Sir Wilfrid was in ecstasies,
And so were all the crowd.

And still we shriek'd, and still we ran,
Throughout the live-long day;
Through loam and sand, through mire and mud,
Through stones and heavy clay.

We turned the earth up from its bed,
Full many a foot below,
And pulverised each verdant sod
As soft as driven snow.

* * * * *

The verses went on to assert that the plough had not paid. A reply in the same measure was made to this production, on the part of some who took a different view.

We commenced our campaign of 1863 by taking the tackle to the Fitz farm, not far from Blennerhasset, to plough lea. The bailiff there, who had been a prize ploughman in his day, gave us, on commencing, some useful hints in arranging our coulter and shares. We got into a level field, clear of stones, and made good progress; and, for the first time, exceeded our master's expectations, by ploughing over five acres in one day. Our good luck, however, lasted exactly one day. Working next at home, I learn from the diary that we "had bad luck: got only three acres ploughed in three days. Can't stand it: costs 30s. per acre."

Working next in the field where we had turned our first furrow, we found it had been drained; and, as we worked in

Fortune smiles.

the same direction as the drains, one wheel of the grubber would sink in a drain, and the other remain in firm ground; thus preventing the work being done well and us from making a profit; and causing endless vexation and annoyance till we got across the field. While in this field we had also the misfortune to break the travelling cog-wheel of the engine, in bringing her out of a gutter into which she had slid in moving forward. This wheel cost £5 10s. and took two days to get ready again.

We began at this time to make new implements at home. A large harrow was made to work by the engine; but as nothing would work with the clip-drum, unless it had slack gear attached, it proved a failure.

We were somewhat flattered by being employed a second time to work for Mr. Norman at Oughterside; for so unfortunate had we generally been, that we felt sure that after one visit we would be wanted no more at the same place. But evidently our first employer was enterprising in applying science to farming. We were usually more successful abroad than at home, too, when we had to make a removal; and while working this time for Mr. Norman we made what we thought a splendid removal. For, within four hours of finishing one field, we were ready to start in the next; after travelling two miles by road. On passing through Aspatria market-place, on the Whitsun hiring day, on our way home after this engagement, we were, as may easily be imagined, the observed of all observers.

It is not to be wondered that we now longed for the time when Mr. Lawson could be induced to exchange for the Double Engine System; for, in that case, we would get rid of the anchor, slack gear, clip-drum, and one row of porters, at one stroke. Often when we had a stoppage or breakage we used to say, "That wouldn't happen if we had Savory's Double Engines."

We learned that two shifts daily were being worked with this Double Engine System; and we at once adopted the same plan,—the first shift working from daylight till noon, and the second from noon till dark. This continued with fair success till June 22nd. Soon after that, we finished the

Making a Profit out of a Loss.

season's work; not however without more or less of breakages. We had not worked long in the autumn before we broke the clip-drum; and so we continued;—mending, working, and breaking, so long as the weather would allow us to work.

The engineman, ploughman, and anchorman, were now getting interested in the balance-sheet soon to be prepared; for, early in the year, Mr. Lawson had promised them 5 per cent. each “of all the money that this year's steam-plough balance-sheet shows the loss to have been less than £200. The year's loss was shown to be £132 10s. 7½d. The result was therefore £3 7s. 10½d. given to each. It should have been more; because, since the sale of the tackle, we find far too much was charged against us for its depreciation; besides our being charged £10 13s. 9d. interest on the previous year's loss. However, we workers were thankful for having made, as far as we were concerned, *a profit out of a loss*. Still, working as we did with such adverse fortune; losing money as we knew we were doing; feeling, too, that we were disliked by all the other farm hands, and that every man's hand was against us; it was a weary and disheartening thing to attempt to make steam cultivation a success. That end seemed a long way off. We kept steam plough accounts and knew we were losing; though accounts proper of the farm were not kept; but had we known, whilst we were being ridiculed for our losses and crosses, that the farm balance-sheet was destined ultimately to show a loss of a pound for every shilling lost by the steam plough, we would better have maintained our own against pride, prejudice, and ignorance.

It would be but vain repetition to tell consecutively all our doings during '64, '65, and part of '66. We kept struggling on—as we got one thing mended, breaking another; nor did we lack variety; for at irregular intervals some other part gave way that we little expected, and that had never broken before. In March, 1864, we tried to plough by lamplight; but failed. On the 24th of that month we worked all night from 6 till 6; stopping one hour for a midnight meal. We grubbed 5 acres;—about as much as was averaged during the day time. Working all night might

Ploughing by Lamplight.

have answered, if we could have kept regularly at it. But it took some time for the night-shift to form the habit of getting sleep during the day ; and no sooner was it formed than perhaps a breakage occurred, to spoil the arrangement; the engineman had difficulty, too, to get the night men to work cheerfully ; for none of them could see why he should work the night-shift and others by daylight. Only on one occasion did the engine fire keep continually lighted for a full week.

During this spring (1864) we broke the crank shaft and the upright shaft ; and on these two occasions had the mortification of seeing the tackle stand idle three weeks in all, during the best of weather, and at a time when most needed. Later on, we broke the anchor in its strongest part, and were detained ten days more till we got another. One day, however, we found ourselves in a little bit of plain sailing, and got on wonderfully ; doing three acres in two hours, and demonstrating that it was possible to cultivate sixteen acres a-day. On June 18, we went to Sunderland-common, a field of forty acres, to grub it twice over. Two weeks should have finished this work ; but to such an extent did our tackle suffer, that with breakages, stoppages, and wet days, it took us *two months* to perform our task.

By this time our grubber, which had now been working over two years, was so broken, strained, and patched, that it was decided either to send it to Leeds, to be thoroughly repaired, or to have another in its place. We were informed that it was so far disabled as to require a new middle, and two new ends ; so, seeing no difference between this and a new one, we ordered a five-tined grubber, *extra strong*, at the same price (£70) as the seven-tined one. We had found that five tines were as many as the engine could draw, to cultivate as deeply as Mr. Lawson desired. Nay, so fond was he of deep cultivation, that I have known us work with only three tines ; and going from eighteen inches to two feet deep. No wonder, then, the grubber so soon needed a new middle and two new ends !

The new grubber commenced work on Sept. 13, '64 ; and I find at that date the following entry in my diary : " Scarified

A Moving Scene !

a whole day and broke nothing ! I think this is the first time we have ever done so." A wonderful thing for us, and far too good to last ; for, 11 days after, we broke a very important part of the engine—a crank-shaft support. We sent for another ; but the railway company sent it from Leeds by way of Liverpool, taking a fortnight to perform a two days' journey ; and causing us a delay of *three weeks*, in the best of autumn weather !

We prepared again, always hoping for better luck ; but alas ! we were soon to meet a more serious disaster. On Oct. 14 we were at work by two A.M., getting up steam to go to Shatton Lodge, a place twelve miles distant. In going down Baggrow Brow at the commencement of our journey, the travelling gear, which had *never* been in good working order, went wrong : two cog-wheels also slipped their gearing ; and the engine, having no brake to hold her, rushed headlong down the steep incline, increasing her speed every moment. The steersman and I jumped for our lives. On looking up, I was terrified to see her making direct for a cottage, in which, if she reached it, she would bury herself in ruins, killing or laming the inmates. Luckily, however, one of the steerage wheels struck some rubbish on the roadside, and the engine, suddenly swerving to the left, went thud against the stone buttress of a bridge belonging to the Maryport and Carlisle Railway, recently erected and not yet finished, where she knocked in an ashlar some inches from its place (as it may be seen to this day) ; and snapping the forewheels asunder, the engine lay instantly a huge helpless mass of ten tons of iron, fully ten yards from where she struck the bridge.

A crowd soon gathered round us ; and, receiving valuable aid from the railway men, we got the fore end lifted on to a bogie, and by means of horses conveyed her to Blennerhasset.

Immediately after the catastrophe, a messenger on mule-back was sent to turn back the advance party who were in charge of the rest of the tackle ; they being disappointed, went on the spree ; and turned in one by one, during the evening, in a deplorable condition.

In one respect it was well the accident happened ; because

Shadow and Sunshine.

we now got the travelling gear repaired, and put into first rate working order. By Nov. 1st we commenced again: but, after working a fortnight, in which time we broke the anchor gearing and rendered it perfectly useless, we gave up for the winter.

Before starting again in 1865, we had sent the old anchor to Leeds, and got a third, a new one—the latest improved; having six discs instead of four, like the old one. This answered well; that is, for an anchor.

Prior Hall Farm having come into Mr. Lawson's possession at Candlemas, 1865, we went there soon after to plough. Here, though we met with our usual bad fortune—breaking socs, and ploughing only about three acres a-day—our engagement proved both encouraging and useful. We found the new bailiff there possessing advanced ideas; and, desirous of applying science to agriculture, he furthered our work as well as he could, and by timely assistance with horses and men enabled us to move from one field to another in two hours instead of four or six.

After this, the journey to Shatton Lodge, so rudely interrupted when the engine ran away, was resumed on April 8. We passed through Cockermouth at two P.M. the same day, and were escorted thence to Shatton, by two policemen and a wondering rabble.

The tackle was placed, and a start made the next day. But ill luck, like an evil genius, still attended us. The engine mired very badly on a rotten headland. After two days' struggling, however, we got to work cultivating; and after breaking a clip-drum pinion, and both slack-gear drums on the grubber;—having to wait a week till new ones came,—with various other interruptions and stoppages; we finished our work in good style, our visit having extended over twenty days. Finishing on a Friday evening, we worked all night in preparing for the journey home so as to get there on Saturday. The journey, during one part of which the engine travelled six miles with one supply of water, was accomplished in $6\frac{1}{2}$ hours.

The night shift was worked pretty successfully all this

Arrival of Cain and Abel.

spring. After doing some more work at home, and at Prior Hall, and also for our first employer, Mr. Norman, at his farm at High Close, we finished for the season.

During the recess we did some threshing at Prior Hall; this being a kind of work we intended to follow and earn something by, when not required to cultivate. At this time also we had an injector put on the engine, and had her thoroughly repaired and painted; the other tackle repaired likewise; and then we were ready for the autumn once more.

Our character we found was improving. We had two other customers for steam cultivation this autumn, and they seemed pleased with our work. Strange it was, but true, that the tackle seemed to do tolerably well for everybody save its owner.

Having a cargo of bones to grind, the engine was next set to work grinding—a very much pleasanter and easier job to all concerned than cultivating. I had hoped some day to have an easy job myself with the engine, after all our toils, troubles, and trials: but no! Just before the grinding commenced I was removed to another occupation. Generally the way—one man roughs it, and another steps in and reaps the fruits of his experience.

We had talked about, and advocated, the double-engine system so long, and had seen the drawbacks of the anchor and slack-gear so much, that in 1866 negotiations were opened with John Fowler & Co. for an exchange; for Fowler had adopted the double-engine system, and in a more practicable manner than Savory. A bargain was the result; and in September the two new engines—which were soon after called “Cain and Abel,” and had their names painted on them—arrived at Aspatria Station. Steam ploughs were no longer new things. No railway superintendents came to unload the new 14 horse-power engines; for indeed none were needed; the trucks were run alongside the platform, steam was raised, and Cain and Abel unloaded themselves. The old engine was in turn run on to a truck, the funnel and fly-wheel taken off; all was fixed for the journey, and, along with the anchor, sent to the place from whence it came.

A Travelling Lodging House Proposed.

Right glad we were to take leave of that unlucky engine, and of the system that was destined to make way for that which we now possessed.

Soon after Cain and Abel's advent, while working at Flimby, twelve miles from home, Cain's travelling clutch broke, and he was unable to travel: Abel had to drag him home. Things began to give way in the new engines, the failing of which we had never experienced with the old one; and we found we were not so near perfection as we had hoped to be. In fact, though our breakages were not so frequent, they were generally different, and on a more extensive scale than with the former tackle. Soon after starting in 1867, for instance, Cain mired in a gutter; nor was he got out till after four days' struggling, and our breaking a road bevel wheel, which cost £5 10s.; and while working at Prior Hall this spring another was broken. A hydraulic ram was necessary before we could get the wheel off and the bevel wheel put on. This year we made a second journey to Shatton, breaking, amongst other things, another road bevel wheel; and while working at Langrigg in the autumn, still another was broken. The old engine had only broken one in all. Still we were working towards success, and we were employed by no less than eight different people this year. With the old tackle the engineman used to be foreman, combining the two offices; but now we were not so humble-minded as formerly, and it was arranged that the foreman's business should be entirely superintendence, not needing him to engage in manual labour. During the year too, we bought a Fowler's harrow, (price £50); and as many people used it, we were enabled to earn more at each place than formerly.

At this time we originated a novel arrangement to suit our migratory style of life. Being much employed from home, the steam plough company often had much difficulty in getting lodgings. Sometimes arriving at a place in the evening, with no houseroom near, they found only a barn to sleep in, with, perhaps, a swarm of rats for company. This had been a sad defect; and to obviate it the chief engineer proposed building a travelling lodging-house! He

A Popular Vote for the Steam Plough.

handed his subject to the clerk of the Blennerhasset Parliament, to be put on the programme for next meeting. Mr. Lawson afterwards handed in the following resolution for the same meeting: "That we offer the steam plough tackle for sale." This latter resolution eclipsed in interest the lodging-house scheme. At the meeting on the subject Mr. Lawson said he had had the tackle for six years; and as it had made no profit, and as his establishment existed for the public good, we should part with unprofitable things. The controlling agent, too, said that it was our bounden duty to keep nothing that did not pay. Most of us, however, felt that if we parted with the steam plough we should renounce our chief distinction as model farmers, and too prematurely proclaim our failure. At the next weekly meeting, when it should have been voted on, a further adjournment for a week was obtained; and in this interval the neighbours were vigorously canvassed. At the next meeting the Parliament House was crowded, for almost everybody now felt an interest in the steam plough. After a few eloquent speeches and much spirited pleading, the momentous question was put, "That we offer the steam plough tackle for sale." Every hand was as motionless as that of a statue. The contrary was then put, and immediately every hand was raised; and, amidst the cheering of an enthusiastic multitude, it was declared by Mr. Lawson "It would not be offered for sale." What effect this motion to sell had upon the steam plough workers we cannot say: but it is true that, while in 1867 the balance-sheet had shown a loss of £343 6s. 9½d., that for 1868 showed a profit of £260 12s. 7½d.!

Having done so well in 1868, it is not to be wondered that early in 1869 a travelling lodging-house was built, according to the plans prepared by the engineman. It proved to be a most excellent and useful thing; for no matter where the men were benighted, they had their steam-plough-home with them, and could rest in peace and comfort.

Having made an arrangement to go to Hutton Hall, a place 27 miles distant from Blennerhasset, it was considered to be a favourable opportunity of testing the cost and quantity of fuel required for removals, as well as the quantity

Cain again inferior to Abel.

requisite to convert a given quantity of water into steam. I made the journey, took notes, and found that the engines converted a cubic foot of water into steam with only $12\frac{1}{2}$ lbs. of coal. We were very satisfied; for this is a small quantity indeed. It took 39 cwts. of coal to move the whole tackle these 27 miles—over rough road—in one day.

Visiting the steam cultivation trials at Manchester in 1869, I observed that Fowler had substituted a turnabout plough for the old balance implement. The latter was an essential part of the old system; for without it the slack gear could not have been attached. And as the double engines could work any kind of implement, we had just taken off the slack gear, and worked on with the balance. But a very objectionable feature of this implement was its having one end high in the air, while the other was in the ground; because on level land it prevented the working end sticking to its work; and in crossing hilly ground it dragged the implement downwards, making it sometimes impossible for the ploughman to keep it to its work. All this was obviated in the turnabout implement. It was a pity we did not adopt it; for I am convinced it is *the* implement for making steam cultivation pay.

It is something remarkable that, although Cain and Abel were built alike, from the same plans; and apparently the same in material and quality of workmanship; Cain turned out a much worse engine than Abel. It seemed as if the mark of his namesake had fallen upon him. When a breakage happened, it was usually something belonging to Cain; nor was he long with us till his firebox and boiler leaked so fearfully that we were often stopped for want of water. It was not possible for the waterman to supply him. So in 1870, after only four years work, we had a new firebox put in, at a cost of over £70.

Our character was by this time established; we always had more work than we could perform; and, having added stonebreaking to our list of trades, we were always either thrashing, stonebreaking, or repairing, when not cultivating. We still kept extending our working area too; and in 1869 had worked as far west as Workington, and as far east as Hutton;

Record of Dangers.

—places 50 miles distant from each other. By the adoption of the double engine system, too, we had certainly freed ourselves from innumerable stoppages, breakages, and losses ; but the reader must not suppose that it was all plain sailing yet. Many a time did the engines stick fast, and require the accumulated skill of half-a-dozen years to extricate them.

To continue the history in detail till the time the tackle was sold, would be but a repetition of difficulties overcome and dangers avoided. Still, with all our misfortunes, we had only met with two serious accidents to those engaged at the tackle. One of the enginemen got his thumb crushed while cleaning the engine in motion, immediately after it had been painted in 1865. On another occasion, in 1870, one of the porter men not getting out of the way when the engine was tightening the rope, it suddenly and sharply hit his leg, and broke it. These were, I think, the only two serious accidents ; and they both mended well. There was one very narrow escape, however, near Workington in 1869. Abel was on a headland close to a steep ravine ; and the weather proving wet, the land became slippery ; and in trying to move forward he slid so near the edge, that there appeared but a hair's-breadth between him and certain destruction. The engineman pulled up, as well he might : it was a fearful moment, and the position most critical. Before starting again he had a road cleared for the wheels, everything put in good position, and the steam raised to the highest pitch ; then applying the full force of steam at once, the next moment Abel and his driver were at a safe distance from peril.

Were it desirable, I might further tell of our journeys to Lanercost Abbey, where the rustic crowd gazed in mute astonishment at our wonderful system of tillage ; to Plumptre, to Hayclose, to Baggrow, to Westnewton, to Hayton Castle, to Crookdake, to Aigle Gill, to the Glebe Farm at Irthington : to Cannobie, in Scotland,—where we were detained days and weeks through goods being sent wrong on the railway, for which we tried the case in a court of law, and got only what the railway authorities had offered out of

Further Difficulties with Abel.

court—to Dearham Hall, to Blaithwaite, to West Ward Parks, to Crummock Bank, or to Oughterside Farm, whose occupant we held in great esteem, for he was the first to appreciate the old tackle, and the last to patronise Cain and Abel.

In crossing the metal bridge spanning the Maryport and Carlisle Railway, at Dearham, in 1871, Abel broke through, and but for a strong girder would have gone crash on the rails beneath. As it was, one wheel projected so far below as to prevent the engines from passing on one line of rails below. Great excitement prevailed—traffic was stopped.

A red cap pilotman was quickly brought to conduct all the traffic over one line of rails. The locomotive superintendent arrived with implements and workmen, and on the same evening Abel was safely got out of his perilous position. The law being hard on road locomotives, we got all the expenses to pay.

In 1871 the Blennerhasset estate was sold; the establishment was to be broken up, and the tackle to be disposed of by auction. We had no lodging-house now; it unfortunately *perished* in the great fire.

Our fame had spread far and wide, we expected a great multitude at the sale and were not disappointed; we had handbills printed containing particulars of the tackle, and distributed amongst apparently intending purchasers.

OUR STEAM PLOUGH TACKLE

(*Fowler's Double Engine Set*).

To be offered for Sale on Friday, 5th January, 1871 :—

| | Cost Price at Blennerhasset, exclusive of several Improvements. | | |
|--|---|----|---|
| Two 14-H.P. Self-propelling Engines—Cain and Abel— (new, Sept., 1866) with Boxes of Tools and extras, . | £1,264 | 5 | 0 |
| Two Giffard's Patent Injectors, attached to the above, . | 49 | 12 | 6 |
| A Four-furrow Baiance Plough (improved since), . | 89 | 0 | 0 |
| A Seven-tined Grubber (improved since), . . . | 72 | 17 | 0 |

Detail Prices of Bill of Sale.

| | | | |
|--|-----|----|---|
| Another Seven-tined Grubber, extra strong (improved since), | £74 | 6 | 6 |
| A Harrow (very much improved since), | 53 | 0 | 0 |
| A Water Cart, complete, | 27 | 19 | 8 |
| 500 Yards of Steel Rope, | 52 | 0 | 0 |
| Six Porters, | 9 | 0 | 0 |
| One Road Driving Wheel, £5 10s.; One Set of Winding Gear, £2 7s. 6d., | 7 | 17 | 6 |
| One Double Pinion, 5s.; Four large Guide Pulleys, 14s., Six small Guide Pulleys, 15s.; One Clutched Wheel, £2 10s.; Two Clutches, £2 5s. | 0 | 19 | 0 |
| One Piston End and Three Rings, £1 10s.; One Strap and Brasses for big ends, £1 19s. 6d., | 5 | 10 | 0 |
| Five Covers for Pump Clacks, 6s.; Six Mud-hole Covers, 6s., | 3 | 9 | 6 |
| One Plunger for Pump, 5s.; One Pinion for Slant Shaft, £1 2s. 6d., | 0 | 12 | 0 |
| Four Pins for Driving Wheel, £1 2s.; One Spring Brake, 5s., | 1 | 7 | 6 |
| Seventeen Ferrules, 17s.; Four Head Lamps, £6; Six other Lamps, £5 10s., | 1 | 7 | 0 |
| One large Screw for Winding Drum, 10s.; One Syphon Lid, 2s., | 12 | 7 | 0 |
| One Set of Moulds, £3 10s.; Two large Oil Tins, £1, | 0 | 12 | 0 |
| Twenty-one Cast Iron Skyfes, £8 18s. 6d.; Three Steel Skyfes, £6 6s., | 4 | 10 | 0 |
| Three Mould Boards, £1 17s. 6d.; Six Wrought Iron Socs, £1 10s., | 15 | 4 | 6 |
| Five Cast Iron Socs, 6s. 3d.; Three Dozen Land Sides, £1 10s., | 3 | 7 | 6 |
| Four Tines, £2; Three Extra Strong Tines, £1 17s. 6d.; Eleven Brackets, 18s., | 1 | 16 | 3 |
| 179 Socs, £17 18s.; 60 Socs, £2 17s. 6d., | 4 | 15 | 6 |
| Two Shackle Pulleys, Cheeks, &c., complete, | 20 | 15 | 6 |
| Six Double Moulds, complete, £12 12s.; Seven Socs, 4s. 8d., | 1 | 13 | 0 |
| One Pair Bushes, new, 10s.; One Pair Blocks, £3 12s. 6d., | 12 | 16 | 8 |
| Seven Porter Wheels, 14s.; Three Pulleys, 7s. 6d.; Three Head Stocks, 9s., | 4 | 2 | 6 |
| Two Screw Jacks, | 1 | 10 | 6 |
| One Snatch Block, £2 5s.; One Snatch Block Wheel, £1 5s., | 8 | 0 | 0 |
| One Road Pinion, £1 2s. 6d.; One Single Bracket Pinion, £1 2s. 6d., | 3 | 10 | 0 |
| Two Steerage Pinions, 10s.; Screws for Steerage, 10s., | 2 | 5 | 0 |
| Split Pins and Studs, | 1 | 0 | 0 |
| | 0 | 10 | 0 |

£1,811 19 1

Result of the Auction.

This Tackle is fitted up for working the Plough, digging breasts, scarifying breasts, Grubber, or Harrow, and can be got ready to leave a field in 15, or turned to cross its work in 10 minutes.

Each Engine is able to convert a cubic foot of water into steam with 12½lbs. of coal—a remarkably small quantity.

As Abel has been found to give out 22⅔ H.P. at 55lbs. pressure, we believe fully 28½ H.P. to be directly applied to an implement when we work at 80lbs. pressure. 1 ton 19 cwt. of coal has moved the whole tackle 27 rough miles in a day.

For the *Character of our Steam Cultivation* we beg to refer purchasers to Mr. Horn, of Baggrow, Aspatria; Mr. Richardson, of Hutton Hall, Penrith; Mr. Hesket, of Plumpton Hall; Mr. Alexander, of Shatton, Cockermouth; or Mr. Blackstock, of Hayton Castle, Maryport.

Both Engines are adapted for a variety of belt and other work, and one of them is *constantly employed* in breaking stones for highways, while the other is *in frequent demand* for thrashing, and all are moveable *without the aid of Horses*.

We had the Engines fitted up with Blow Pipes, Waste Steam Pipes, and Suction Pipe Improvements.

The *Cylinders* are in good order; and the tackle, as a whole, has been kept in such *good repair* that we know it to be in many respects as good as it was when we got it, and in some respects better.

WILLIAM LAWSON.

Quarry Hill, Wigton,
Cumberland, 1st January, 1872.

On January 5th, 1872, the first day of the sale, the tackle was put up and knocked down for £900. It was bought for a limited liability company, the chief of which was the writer of the satirical poetical history. How Times are Changed!

From the following Tables may be gathered a Balance Sheet for every year, the amount of work done in each and every year, and the totals of all expenditure and receipts. It will be seen that we earned much money, and spent much, especially the latter.

CONDENSED BALANCE SHEETS OF STEAM PLOUGH.

68

| | 1862. | 1863. | 1864. | 1865. | 1866. | 1867. | 1868. | 1869. | 1870. | 1871. | Totals. |
|---------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| Wages | £ 62 | £ 65 | £ 129 | £ 178 | £ 153 | £ 288 | £ 282 | £ 245 | £ 301 | £ 280 | £ 1984 |
| Coals | .. | .. | 17 | 15 | 38 | 90 | 63 | 57 | 62 | 61 | 402 |
| Oil | 7 | 8 | 15 | 21 | 68 | 38 | 34 | 25 | 32 | 30 | 278 |
| Repairs—Tackle. | 68 | 51 | 107 | 223 | 128 | 222 | 192 | 231 | 117 | 173 | 1510 |
| Rail Carriage | 19 | 1 | 4 | .. | 47 | 10 | 7 | 4 | 5 | 4 | 100 |
| Sundries | 13 | .. | 6 | 5 | 3 | 44 | 33 | 59 | 58 | 90 | 310 |
| Repairs—Thresh. Machine | .. | .. | .. | .. | .. | 13 | 28 | .. | 7 | 10 | 58 |
| Add Depreciation | 169 | 125 | 278 | 442 | 437 | 705 | 639 | 621 | 581 | 648 | 4646 |
| Subtract Appreciation | 73 | 73 | 73 | 76 | .. | 175 | .. | .. | 153 | 480 | 1103 |
| Net Expenditure | 242 | 198 | 351 | 518 | 389 | 880 | 475 | 601 | 734 | 1128 | 5517 |
| Subtract Earnings from Expn. | 97 | 160 | 256 | 518 | 366 | 537 | .. | .. | 667 | 715 | 4667 |
| “ Expn. from Earnings. | .. | .. | .. | .. | .. | .. | 746 | 604 | .. | .. | .. |
| Losses | 145 | 38 | 95 | .. | 23 | 343 | .. | .. | 67 | 413 | 1124 |
| Profits | .. | .. | .. | .. | .. | .. | 271 | 3 | .. | .. | 273 |
| Total loss during ten years | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 850 |

The odd shillings and pence have been excluded from the yearly columns to simplify the tables.

DETAILS OF EARNINGS OF STEAM PLOUGH.

| | 1862. | | 1863. | | 1864. | | 1865. | | 1866. | | 1867. | | 1868. | | 1869. | | 1870. | | 1871. | |
|-------------------|-------|----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|
| | Ac. | £ | Ac. | £ | Ac. | £ | Ac. | £ | Ac. | £ | Ac. | £ | Ac. | £ | Ac. | £ | Ac. | £ | Ac. | £ |
| Ploughing . | 40 | 26 | 21 | 11 | 22 | 11 | 21 | 11 | 15 | 7 | 26 | 13 | .. | .. | 40 | 20 | 84 | 50 | 35 | 21 |
| Grubbing . | 213 | 67 | 408 | 149 | 405 | 245 | 519 | 268 | 487 | 244 | 511 | 312 | 720 | 478 | 744 | 378 | 673 | 409 | 494 | 326 |
| Harrowing . | .. | .. | 7 | .. | .. | .. | .. | .. | 7 | .. | 600 | 105 | 1006 | 161 | 854 | 139 | 483 | 100 | 794 | 139 |
| Stitching . | 12 | 4 | 7 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Belt Work . | .. | .. | .. | .. | .. | .. | .. | 13 | .. | 112 | .. | 88 | .. | 80 | .. | 33 | .. | 80 | .. | 210 |
| Travelling . | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3 | .. | 10 | .. | 15 | .. | 22 | .. | 23 | .. | 10 |
| Goods returned . | .. | .. | .. | .. | .. | .. | .. | 5 | .. | .. | .. | 9 | .. | 12 | .. | 12 | .. | 5 | .. | 8 |
| Charged to Farm | .. | .. | .. | .. | .. | .. | .. | 221 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Land Improvement) | .. | 97 | .. | 161 | .. | 256 | .. | 518 | .. | 366 | .. | 537 | .. | 746 | .. | 604 | .. | 667 | .. | 715 |

| | | | | | | | | | | | | | | | | |
|------------------------------|----------------------------------|----|----|----|----|----|----|----|----|----|----|----|-----------|-------|----|----|
| Totals for the Ten Years. | Ploughing . | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 281 acres | £169. | 7 | 6 |
| | Grubbing . | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 5173 | 2876 | 0 | 5½ |
| | Harrowing . | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3751 | 645 | 13 | 6 |
| | Stitching . | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 19 | 4 | 4 | 6 |
| | Belt Work | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 615 | 16 | 2 | 2 |
| { | Travelling | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 83 | 4 | 6 |
| | Goods Returned | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 51 | 15 | 2½ |
| | Charged to Farm Land Improvement | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 221 | 1 | 8 |
| Total Earnings . | | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | £4667 | 3 | 6 |

Comparative Items.

STATEMENT SHOWING CAPITAL INVESTED, AMOUNT REALISED, AND
HENCE THE ACTUAL DEPRECIATION.

| <i>Year.</i> | <i>Kind of Transaction.</i> | <i>£</i> | <i>s.</i> | <i>d.</i> |
|------------------------------------|--|--------------|-----------|-----------|
| 1862.... | Bought full set of Tackle..... | 825 | 0 | 0 |
| „ | „ Water Cart..... | 25 | 0 | 0 |
| „ | „ Grubber with Stitching Moulds | 69 | 0 | 0 |
| 1864.... | Exchanged Grubber..... | 50 | 0 | 0 |
| 1865.... | Put Injector on Old Engine..... | 26 | 8 | 5 |
| 1866.... | Exchanged Tackle for Double Engine System.. .. | 676 | 4 | 6 |
| „ | Bought another 7-Tined Grubber.... | 70 | 0 | 0 |
| 1867.... | „ Harrow..... | 50 | 0 | 0 |
| 1869.... | Put Injector on Cain (Abel had the Injector from Old Engine)..... | 23 | 4 | 1 |
| „ | Hose for Washing out..... | 8 | 10 | 0 |
| „ | Bought Water-Cart Horse..... | 30 | 0 | 0 |
| „ | „ Lodging House..... | 82 | 17 | 6 |
| | | <u>£1936</u> | <u>4</u> | <u>6</u> |
| Realisation when all was sold..... | | 1064 | 18 | 7 |
| Net Depreciation for Ten Years.... | | <u>£871</u> | <u>5</u> | <u>11</u> |

During the first five years our capital was £919; during the last five years, £1,936 4s. 6d.—making a rough average of £1,417 during the whole ten years. Depreciation, as shown above, amounted to an average each year of $6\frac{1}{8}$ per cent., and very clearly shows that 15 per cent. depreciation is a rate fabulously too high to charge.

There are some leading facts in these Tables :

- I. That there were two years in which a profit was made.
- II. That there is a net loss of £850 7s. 9d. upon the whole transaction.
- III. That the total income was £20 18s. 2d. more than the total expenditure; and as the tackle depreciated £871 5s. 11d., a net loss of £850 7s. 9d. resulted.
- IV. That the wages, £1,984 18s. 4d., and repairs, £1,510 15s. 6½d. were the *great* items of expenditure.
- V. That during ten years we only ploughed 281 acres, grubbed 5,173 acres, and harrowed 3757 acres, a

The Useful Results Obtained.

very small quantity ; for if we had only grubbed 8 acres a-day, during 150 working days a-year, it would have given 12,000 acres instead of 5,000.

- VI. *The irregularity of the amounts charged for depreciation.* It appears that in some years the tackle appreciated instead of depreciating.

This last observation calls for some explanation. The first year of appreciation was 1866. In this year we exchanged the tackle, and getting a good bargain, the tackle at the end of the year was better than at the beginning of it. But what can be said of '68 and '69, in which for two years running, the tackle appears to have kept improving in value to the extent of £183 19s. 5d., while it actually grubbed 1,464 acres, and harrowed 1,860?

The new system lost money as well as the old one ; the enginemen maintained that we had charged depreciation to an enormous extent ; so, when put on their trial in '68, they had free access to the books of account, and were allowed to take stock themselves ; and a big stock they took. The depreciation in 1870 and 1871 shows that steam-plough enginemen are not the best judges of depreciation ; and we should have been nearer the truth to have continued as we had been doing.

Had Mr. Lawson's establishment existed solely for the sake of making profits and getting gain, the result would have been very lamentable ; but existing as it did for the public good, there was this satisfaction, that our losses were but stepping-stones to that measure of success now attained in steam cultivation.

The cause of our losses is not far to seek. £1,510 paid for breakages and repairs, in finding out what *would* answer, by first finding out what *would not* answer, explains a good deal. It was necessary that some people should buy and use the early defective systems, or how could inventors and manufacturers have continued till a degree of perfection was attained?

That we did contribute to this end is manifest from the great number of sets of tackle now in use, and the increasing

Pleasant Prospects.

number indicates a future in agriculture, once hopefully described by our Prior Hall Bailiff, who in a commemorative speech declared that things would go on and progress till Cain and Abel would climb the steep hills of Skiddaw, till the merry sound of their whistle would be heard in the green dales and grassy vales where the red deer wander and the child loves to play, and till, by this mighty power, the brown hills of Cumberland would wave with the golden grain.

M. T.

CHAPTER V.

FREE CO-OPERATION.

IN the year 1867, the idea of what was called *free co-operation* had been brought forward. It seemed to some of us that the co-operative societies of the time were too exclusive in their character, inasmuch as they were societies, generally, of *separate classes or sets* of people, not aspiring so much to co-operate for the public good, as for the good of their respective classes or sets. For instance, there were in England, or on the Continent, co-operative shop-keepers, co-operative locksmiths, co-operative masons; but it was not a common thing to find people ready to work together for *the public good*, irrespective of all consideration of party or of accidental and artificial distinctions.

Accordingly, it was suggested that a new movement should be set on foot—having for its real and professed object, not merely the good one of earning as much profit as possible for shareholders, or the better one of earning as much profit as possible for workers, or the still better one of earning as much dividend as possible for purchasers, but neither more nor less than that of being *as useful as possible to the public at large*.

Believing, as I did, that co-operation with that one great object for its bond of union, would ultimately be found sounder in principle, and more productive of the general good than the co-operation of the then existing co-operative societies would be, I published a statement declaring that all the profits over $2\frac{1}{2}$ per cent. per annum on a stated amount of my capital, during a certain time, would be devoted to the *public good*; and I invited everybody who was able and willing to co-operate with me for that end, to do so in any way that occasion might offer, and particularly in the matter of making, for the public use, as much

Distribution of Profits.

profit as possible, on the capital devoted to the public good, on the terms above mentioned.

The balance-sheet of 1867 showed no profits over $2\frac{1}{2}$ per cent. per annum on the capital; and, chiefly on account of a very great change in the valuation of the land and buildings, the balance-sheet for the three months and twelve days ending 1st April 1868, showed a loss of £6147 9s. $3\frac{1}{2}$ d.; but the balance-sheet for the eight months and nineteen days ending 19th December 1868, showed a profit, over $2\frac{1}{2}$ per cent. per annum, of £181 2s. $10\frac{1}{2}$ d. Of this amount £142 8s. $11\frac{3}{4}$ d. had been spent during the year for the public good, leaving £38 13s. $10\frac{3}{4}$ d. still to be spent for the same object. As to how this £38 13s. $10\frac{3}{4}$ d. was to be spent, I consulted my neighbours in public meetings at Blennerhasset, Ireby, and Aspatria. The Ireby people suggested that any funds I had to dispose of should be given towards building an assembly-room at Ireby. Among the various objects on which it was proposed to spend the money were a sick fund, a burial society, and a Primitive Methodist chapel; but the strongest desire was shown that this profit be *given to those who made it*, meaning that it should be given proportionately to the workers employed in the establishment. Ultimately, £30 of this money was given in this way to the workers—to each person according to the time for which he had been paid wages, yielding three-pence and $\frac{5}{16}$ d. a-week to each worker, whether man, woman, or child. The remaining £8 13s. 10d. was contributed to the Aspatria Cottage Hospital Fund; but the Aspatria worthies who got the money, sent it away to be spent in doctoring the wounded soldiers of the Franco-German war.

In 1869 we closed our Newcastle business; and as its history is of more than merely financial interest, it is given here.

In the spring of 1866 the terrible cattle disease, rinderpest, had killed a great many of the cows that supplied milk to the town of Newcastle-on-Tyne, so that milk had become very dear there; and, for a good while we sent

Adventures at the Newcastle-on-Tyne Dépôt.

new milk there daily, from the Blennerhasset farm—taking it about two miles by cart and about eighty miles by rail—a dealer giving me elevenpence per gallon for it delivered at the Newcastle railway station. Thinking we were not getting a high enough price for the milk, we asked for more; but as the dealer refused to give it, we determined to try retailing it in Newcastle, and went there to start the business. Our cows were at that time very highly fed, and gave such exceedingly rich milk as the Newcastle people have perhaps never seen retailed in their streets before or since.

But, for the retail trade, it was necessary to make the business known. Many small printed handbills, describing the excellence of the milk, were distributed in such parts of the town as we intended to deal in. The following is a copy of one of them:—"The pure milk and cream from Brayton, Cumberland, comes in at 1 o'clock, and is sold all over the town under the striped flag. New milk, 5d. per quart; old milk, 2½d. per quart; cream, 2s. per quart. William Lawson. Bell's Temperance Hotel, Newcastle-upon-Tyne, January 16th, 1866." Some large printed bills were carried through the streets; a horse and cart for hawking the milk about the town were hired, also a milkman, a very respectable looking Tyne-sider, at a guinea a-week. A loud sounding red tin horn announced the next arrival of milk from home. A large tricoloured calico flag was nailed to a long staff and erected on the cart; but thinking it likely to alarm passing horses, it was struck, after a short display. We retailed the milk at 5d. per quart, at which price it was eagerly bought, the people flocking to the cart with their jugs.

Having satisfactorily started the Newcastle retail milk trade, it was left in the hands of the highly-recommended, respectable-looking Tyne-sider, who had full charge of the business. For a few days the milk was regularly sent from Blennerhasset to Newcastle, and all seemed to be going on well, when a telegram came from some compassionate friend at Newcastle to the following effect:—"Three days' milk at station—man drunk."

The People's Shop at Blennerhasset.

A trusty young man was at once despatched from Blennerhasset to put things right. Of course he did not find the milk improved by its stay in the Newcastle station; and carefully collecting the several days' supply, he sent it all back to Blennerhasset!

Subsequently we established a shop in Pine Street, Scotswood Road, Newcastle, for the sale of milk and vegetables, and other farm produce; and in connection with it had a stall in the butcher market, sending beef there from the farm. When, however, we gave up the Newcastle business, after some three years' mismanagement, the total loss was £545. Much of this was, however, loss on the sale of the house property in Pine Street, which we had purchased in 1866 for the better carrying on of the business. But on the trading business the loss would not be far short of £400.

Besides the Newcastle shop we also commenced one in Carlisle, another in Blennerhasset, and a fourth in Ireby, the financial results of which will be found in another chapter.

In the village of Blennerhasset we started the shop in 1867, and this, after several ups and downs—chiefly downs—was doing a trade of nearly £20 a-week. On our parting with the estate in 1872, it was handed over to the People's Shop Company, Limited. This company pays a fixed interest to its shareholders, of $7\frac{1}{2}$ per cent. per annum on their capital, and, through the check system, yields also its profits to purchasers, in proportion to the amount of their purchases—a near approach to what was called the Timothy Tarbucket system of shopkeeping.

There were occasional changes of the storekeeper in the Blennerhasset "people's shop," and latterly the storekeepers were elected by the village parliament; and the report of that assembly states, that on the 4th January, 1870, the storekeeper of that time was voted to be kept in his place by a unanimous vote of fifty.

Another branch of business was begun in 1869, the propriety of investing in government bonds of the United States of America, being discussed on August 17, and £5,000 being finally voted to be so invested.

Blennerhasset from a London Point of View.

Our parliamentary records of 1869, show also that there seems to have been great trouble with trespassers this year; for on 31st August it was unanimously carried, "That trespassing on the grounds belonging to Mr. Lawson be actually stopped during his absence."

We were in the habit, during some years, of accommodating relays of London city missionaries with board and lodging at the farm in the summer time. Sometimes they came accompanied by their wives and families; and they usually stayed with us for a holiday of several weeks each. A kind friend used to pay their fare from London to Blennerhasset and back, and we had the pleasure of their company at the farm, supplying all their wants, generally, except wine and beer. I trust we succeeded in making them happy and comfortable while they were with us, and that when they left us to go back to their London duties, they generally did so with improved health.

One who seems to have enjoyed his visit, sent us after his return to London a copy of the *Temperance Star* of August 20th, 1869, with an account of what he styled our "Teetotal Farm," as he saw it. Some passages set forth that "two or three weeks at a farm is always a treat to a Londoner, and 300 miles is a nice distance from Bow Bells. If it be a model farm, the eggs and butter are all the sweeter, and if it be a Teetotal Farm, the hay and straw are all the cleaner. Our farm is all this, and more. It is situated near the famous Skiddaw mountain, and if the name is any guide, it is Blennerhasset. This name is well-known in Cumberland. The proprietor farms human beings, as well as sheep and turnips. He is a scion of the late Sir Wilfrid Lawson, who, thirty years ago, ordered all his whiskey and its kin out of his cellar and poured it into a pond. The Blennerhasset Farm contains a gasometer; a smithey, like a small foundry; a huge hydraulic engine for irrigation; a laboratory for manures; 700 volumes to enlighten the lads on the farm; two steam engines; a waterwheel under ground for driving, thrashing, chaff-cutting; washing-machines, a flour mill, and lathes, tramways, turn-tables, and trucks for feeding the cattle. Over the stables and cowsheds were long rooms,

The Missionaries' Bill of Fare.

labelled—'Lecture Hall,' 'Music Hall,' and 'Banqueting Hall.' Inside were painted posters—'This way forward,' 'This way out.' In a corner of a long double room was a regular refreshment bar, with a list of provisions that would be respectable at Islington or Norwood; and on the rafters were mottoes of social progress and order. Every ear and every potatoe and turnip seemed to grow mathematically. One field was an acre of ripe strawberries and fruit for preserves. Asking an old woman when they were going to brew, she said, 'Na, ye'll get none o' that here.' The grass is cut and dried by machines, that do it quickly; and the men and women load waggons and ricks. Everybody works with a good will, because what is done on the farm is regularly discussed in full council. A balance-sheet is published, and a bonus comes to the labourer at the end of the year, as well as a dividend for an hospital and free school."

The cost of entertaining the missionaries was charged to the public good account. The following figures show the cost of those staying at Blennerhasset farm in the summer of 1869:—

| | | | | | | | | | |
|--|---|---|---|---|---|---|----|----|-----|
| Wages—Attendance, | . | . | . | . | . | £ | 7 | 2 | 6 |
| Groceries (at shop), | . | . | . | . | . | . | 8 | 5 | 10½ |
| Beef, | . | . | . | . | . | . | 11 | 5 | 11 |
| Hams, | . | . | . | . | . | . | 13 | 5 | 7½ |
| Flour, | . | . | . | . | . | . | 3 | 10 | 4 |
| Butter, | . | . | . | . | . | . | 2 | 2 | 4 |
| Milk, | . | . | . | . | . | . | 1 | 19 | 10 |
| Eggs, | . | . | . | . | . | . | 0 | 17 | 6 |
| Strawberries, | . | . | . | . | . | . | 2 | 4 | 1 |
| Other Garden Stuff, | . | . | . | . | . | . | 2 | 2 | 7½ |
| Expenses visiting the neighbouring sights and scenery, | . | . | . | . | . | . | 4 | 8 | 8 |

£57 5 3½

Average was—I man, 166 days.
 „ I woman, 152 „
 „ I boy, 35 „

353 „

Average cost per head per diem was 3s. 2d. 93, or almost 3s. 3d.

There seems to have been some discussion in the parliament about the entertainment of the missionaries; for the

Honourable Feeling of the Workers towards the Missionaries.

parliamentary record has the following entries for 29th March, 1870:—

“1. That no missionaries come except we plan to treat them gentlemanly.” Carried.

“2. That three sets come this year.” Carried.

The first had reference to some proposal for lessening the above cost by curtailing the extent of choice in the bill of fare, and the expenses incurred in taking the missionaries to the sights of the county. But the proposal received no countenance from the parliament. By a “set” of missionaries was meant three missionaries and their wives, so that “three sets” meant eighteen people; and it must be mentioned to the credit of work-people at the farm, that they voted to entertain missionaries at the expense of diminishing their next bonus.

The year 1870 was known at Blennerhasset, and is still recollected as *the great bonus year*. The following notice was printed on cards that were distributed among the labourers:—

“TO MY WORKERS.

“I shall give, as bonus, to ordinary time-workers, in proportion to time worked (exclusive of extra and overtime), one-quarter of this year’s declared income arising from my present capital, clear of all current expenses for public good; but should such income exceed £1000, I shall give as bonus half its excess over £500.

“WILLIAM LAWSON.

“Blennerhasset, Cumberland, Feb. 1st, 1870.”

The above-named offer, substantially, had been sanctioned by the parliament on the 18th Jan., 1870—31 persons having voted for, and 17 against it.

The balance-sheet for that year of the whole establishment showed a balance on the right side of £1,715 4s. od.; and it must be borne in mind that no rent for the farm or garden, or interest on the capital of the establishment, was charged. Some departments of the establishment yielded a profit, and others a loss, that year; but *the net result*, in figures, was a gain of the above-mentioned £1,715 4s.

Of this gain, £546 4s. 7½d. was awarded, according to

Origin of the American Investments.

the above-mentioned announcement of 1st Feb., 1870, to the workers, as bonus on time, affording four shillings and twopence three-farthings per week to each person—man, woman, or child; or ten pounds nineteen shillings and elevenpence to every full-time worker during the year.

We had a very large grain crop that year, numbering 144 stacks on the farm and garden on the 1st Nov., after part of the crop had been thrashed out. Our whole crop that year was valued by a professional valuer at £5,015 os. 10d.; but our own valuation, on the basis of which our balance-sheet was made, was about £265 less than that, and the crop ultimately realised about £145 less than we ourselves had valued it at.

Nevertheless, it is questionable whether the workers got such a large bonus as they might have considered themselves entitled to under the agreement; for the whole cost on account of what went by the name of "American Investments" (which, inclusive of effecting a mortgage on the estate, came to much more than £145) was charged against that year.

These American Investments I first broached in 1870. Having observed that in the United States of America money commanded higher rates of interest, with equal security, than it did in England, it seemed to me that I should increase my income, and thus promote the public good, if I increased the investments in American securities; and with this view it was determined, after several public discussions on the subject, to effect a mortgage on the estate.

Having determined, so to speak, to both eat my cake, and have it, I proceeded to consider the most profitable way of effecting my object. So I advertised that I would offer for mortgage by auction a portion of the estate that was valued at £27,932 7s. 6d., that being almost the whole of it. I arranged the conditions of the "mortgage by auction." These conditions were eighteen in number, with a note saying that I reserved "the right of altering any or all" of them, provided I gave notice of such intention at or before the time and day advertised for the auction.

I here insert the first four conditions.

Proposed Mortgage by Auction.

- I. The estate described in the annexed particulars shall be mortgaged for a term of ten years.
- II. The mortgage will be put up at the following reserved sums, at their respective rates of interest :—
- | | | |
|--|-----------|---------|
| At $3\frac{1}{2}$ per cent. per annum, | | £14,250 |
| „ $3\frac{3}{4}$ „ „ | | 15,200 |
| „ 4 „ „ | | 16,250 |
| „ $4\frac{1}{4}$ „ „ | | 17,500 |
| „ $4\frac{1}{2}$ „ „ | | 19,000 |
| „ $4\frac{3}{4}$ „ „ | | 20,700 |
| „ 5 „ „ | | 22,800 |
| „ $5\frac{1}{4}$ „ „ | | 25,300 |
- III. Each of the above sums, at its respective rate of interest, shall be considered equal to, and as high as, each other. A bid of £25,300, at $5\frac{1}{4}$ per cent. per annum, is as high as, and no higher than, a bid of £14,250 at $3\frac{1}{2}$ per cent. per annum. The highest bid will be determined on a similar basis.
- IV. The highest bidder shall be declared the mortgagee.

The time appointed for the mortgage by auction was one o'clock P.M. on 27th July, 1870—the day of the last Blennerhasset Festival—and the place, the Blennerhasset Farm itself.

The services of an excellent attorney had been secured for the occasion: and I acted as auctioneer, having taken an auctioneer's license on purpose.

But a mortgage by auction was a new thing, for which there was no precedent; and stolid respectability probably had no confidence in such an unheard-of innovation on the customs of our ancestors. Moreover, unluckily for my purpose, there had just been a rise in the value of money shown by the rise in the Bank of England rate of discount, probably due to the Franco-German War which had just broken out.

At any rate, scarcely anybody came to the auction; probable or possible mortgagees might have been counted on one's fingers; and there were no bidders.

I afterwards privately effected a mortgage of the estate on what I considered more advantageous terms than those I had

The Sunday Question at Blennerhasset.

publicly declared myself willing to accept. It was what was called a stock mortgage, by which I borrowed £18,000 at an interest of £4 4s. 4d. per cent. per annum.

But this mortgage was not effected till I had corresponded with several money-lenders in various parts of the kingdom, who offered various sums, at various rates of interest, and sometimes with an air of mystery that was amazing.

In 1870 the Sunday question came before the village parliament, under the following circumstances:—The librarian of the Free Library, in arranging the notice which was to be pasted into every book, appointed Monday evening as the special time, when he, or a substitute, would always be present to change the books; but besides this he added, and open “as far as convenient daily, from 9 A.M. to 6 P.M.” In this “*daily*” he included also Sunday, but afterwards, to prevent disappointment from readers calling on Sundays when it was not convenient, or he was from home, he intimated that he would attend, for certain, from two till four on the first Sunday of every month. The lending of books on Sunday gave offence to some of the people of the village; and on February 8th, 1870, and the meeting subsequent, the parliament discussed the following resolution:—“That William Lawson’s Free Library be closed on Sundays.” At the last and decisive meeting there was a fair muster of Sunday borrowers, chiefly from Aspatria, a large village about three miles to the west of Blennerhasset; and after decidedly one of the best argued debates of the weekly parliament, the motion was negatived by 19 votes to 16.

The Sunday question again came up, two years afterwards; and in reference to an intended lecture, our local record has the following entry for 4th Jan., 1872:—“Mr. Lawson said he would give a lecture on America either on Saturday evening or Sunday. Alexander Arnot made a speech in favour of Sunday. It was put to the vote, and—

| | | | | | |
|-----------------------|---|---|---|---|----|
| For Saturday Evening, | . | . | . | . | 32 |
| „ Sunday Afternoon, | . | . | . | . | 33 |

Of 1871 the chief event was the great fire which occurred on Tuesday the 22nd of August, at the Blennerhasset Farm. At about seven o’clock in the evening, an escape of gas was

The great Fire at the Farm.

observed about the farm buildings; and the gas-manager was informed of it. In going to look for the escape, he took a lighted candle with him, and went into the pulping-house, where, it appears, the escape was. When he went in, of course the flames of the candle set fire to the escaping gas, and an explosion occurred, but without injury to the man himself. The explosion ignited a large quantity of loose straw. The fire spread to the immense Dutch barn which was close at hand; and in a very short space of time indeed the whole place was in a blaze, the barn containing a large quantity of flax. There was much hay, straw, flax, and machinery destroyed in a very few minutes, the pine wood with which the barn was fitted up favouring the spread of the flames. Ready and willing assistance was at once rendered by those on the spot, and the ample water-power appliances for the extinguishing of fire at the farm were soon got into action, but without avail. All efforts were therefore directed more to the prevention of the spread of the fire, than to its extinction; and the communication between the building on fire and the immense byre and stables near was at once cut off, the beams being sawn through, and the roof let down. A messenger was despatched to Wigton for the fire-engine and brigade. At about half-past seven o'clock the flames could be distinctly seen within a mile or so of Wigton; and at Brookfield the smell of the burning hay could be felt.

From Aspatria a great number of people turned out. In the village of Blennerhasset there was alarm felt; as it was feared by the villagers that their houses, which are lighted by gas, would be blown up in some mysterious way from the spread of the flames.

The new farm buildings had been called "*Mechi*," after the great Essex farmer of that name, and that name had been handed in to the Ordnance surveyors; but in 1865 I was induced by one of my advisers, to change the name to *Blennerhasset Farm*, and to send in the latter name to the surveyors for insertion in their map, on which, consequently, that name appears. But my neighbours continued to call the place *Mechi*. The new farm buildings were more than

“Mechi,” the first Name of the Co-operative Farm.

a quarter of a mile from the village of Blennerhasset, and perhaps required a new name; and as mine was not the only farm at Blennerhasset, the name Blennerhasset Farm was not distinctive enough. To the best of my recollection, I had changed the name from Mechi to Blennerhasset Farm *before* I had heard of Mr. Mechi’s financial difficulty; but it was reported that the name had been changed *because of* that difficulty; at any rate, the report was incorrect.

After the distribution of the large bonus of 1870 we naturally expected that our business would continue improving, and anticipated that 1871 would show a good profit too. Much interest was therefore taken in the “manifesto” to be issued for 1871, and more public discussion and advice was bestowed upon it than on any previous one. At last the following was resolved upon, printed, and issued:—

THE

BLENNERHASSET CO-OPERATIVE ESTABLISHMENT.

CAPITAL, £32,780 4s. 8½d.

Approximate Investment of Funds, on or about November 1st, 1870:—

ASSETS.

| | | | |
|---|---------|----|----|
| 415a. 3r. 20p. of Farming and Garden Land, Farm | | | |
| Buildings, Machinery, and Cottage Property, . | £30,000 | 0 | 0 |
| Shop and House Property at Newcastle, . . . | 600 | 0 | 0 |
| Farm and Garden Stock, Crop, Implements, &c., . | 5,554 | 1 | 1½ |
| Two Portable Engines and Steam Plough Tackle, . | 1,300 | 0 | 0 |
| Manures on hand, | 676 | 15 | 0 |
| Sundry other Property on the Blennerhasset Estate, . | 751 | 2 | 2½ |
| American Investments, per Mr. Henry Villard, . | 8,447 | 2 | 6 |
| Invested at 4 per Cent. per annum, and payable at call, . | 2,639 | 0 | 0 |
| Invested in various Co-operative Societies, . . . | 42 | 4 | 6 |
| Book Debts, | 154 | 0 | 4 |
| In the Bank, | 478 | 2 | 10 |
| Cash on hand, | 29 | 10 | 0 |

£51,571 18 6

The last Blennerhasset Co-operative Offer.

LIABILITIES.

| | | | |
|--|---------|----|----|
| Mortgage on 393a. or. 29p. of the Blennerhasset Estate, | £18,000 | 0 | 0 |
| Book Debts, | 245 | 9 | 2½ |
| Bonus to Workers for the year ending November 1st, 1870, | 546 | 4 | 7½ |
| | £18,791 | 13 | 9¾ |
| Balance net Capital, | 32,780 | 4 | 8¼ |
| | £51,571 | 18 | 6 |

We are of opinion that the above statement is correct.

MILLER TIFFIN, Book-keeper.

GEORGE GLASSBROOK, Manager.

CHAS. D. HUNTER.

JOSEPH RICKERBY.

NOTICE.—Of the declared income arising from the above-mentioned capital, for the year ending 1st November, 1871, I shall devote one-third to expenditure for the public good, one-third to the payment of bonus to my time-workers, and one-third to my own use—the income to be declared, and the bonus paid, before the end of 1871. *N.B.*—The bonus is not payable to delinquents, nor is it transferable.

WILLIAM LAWSON,
Blennerhasset Farm, Cumberland, England.

January 2nd, 1871.

I think the taste of bonus in 1870 had some effect in lessening the expenditure of 1871; but the potato disease and the disastrous fire of this year made our profits *nil*.

CHAPTER VI.

VARIETIES OF CO-OPERATION.

BY 1864, one of my companions on the farm had become well informed as to some of the leading features of the great co-operative movement in England; and it was with great pleasure that I secured his aid in what I believed to be the important work of spreading co-operative information in the neighbourhood.

Of course, Blennerhasset was the first village in which we called the attention of a public meeting to our great subject—Co-operative Shop-keeping; and I well remember our early efforts there, and how severely we were handled in public debate by the late village schoolmaster, and how our mouths might have been completely and for ever shut on the subject, if we had not enthusiastically believed in the truth and importance of our cause.

At the village of Aspatria we had better success. Probably our practice and experience in public speaking and debate at Blennerhasset had done us good. Besides, we were supported on the co-operative platform by some well known lay preachers, and there was a strong feeling in the village in favour of co-operation.

At that time among the English people, to whom the word co-operation conveyed a distinct idea, it was generally understood to mean concerted shop-keeping, of which the profits—over five per cent. per annum to the shareholders on their capital—were entirely, or almost entirely, appropriated by the shareholders individually, in proportion to the amount of their purchases at the shop. I say entirely, or almost entirely, because while there were many co-operative societies whose profits were *entirely* appropriated by the shareholders in this way, there were many others that regularly devoted a small proportion of their profits to the

The Timothy Tarbucket Scheme.

education of their shareholders or of the public, and there were some that yielded a small proportion of their profits to non-shareholders. For instance, there were some societies which, when they paid a dividend to their shareholders of two shillings for every pound's worth of shareholders' purchases at the shop, paid also a dividend to non-shareholders of *one* shilling for every pound's worth of non-shareholders' purchases at the shop; this was called giving half dividend or half bonus to non-shareholders. Similarly some societies gave only a quarter, some a third, and some two-thirds dividend, and so on, to non-shareholders.

Our first co-operative meeting at Aspatria was held in the new school-room. A stonemason of Aspatria was chairman; and there was a pretty good attendance. On that occasion our proposition that shareholders and non-shareholders should share equally as to dividend, met with a good deal of opposition. A few evenings afterwards we had, in the same room, with the same chairman, another meeting, at which there was a large attendance, and at which we advocated what was known in Aspatria at the time as the Timothy Tarbucket* system of shopkeeping. This system was to appoint some person shopkeeper for the public good, paying him a certain fixed rate of interest on such capital as he would have to devote to the business, while he was to supply goods to the public at large at the cheapest possible rate. He was to render public accounts, periodically, of all the transactions of the shopkeeping business he would thus be conducting, as the public servant, for the public good. This Timothy Tarbucket proposition was a good deal opposed, though the chairman supported it.

At another well attended meeting soon afterwards in the same place, with the same chairman, the Rochdale kind of confederated shopkeeping—commonly known as the Co-operative Store System—was voted for by a large majority in preference to the Timothy Tarbucket system, the chair-

* Timothy Tarbucket was used simply as a name for the supposititious shopkeeper.

Barrow and Balance-Sheet Propagandism.

man telling the victorious majority that their scheme was "too narrow" for him.

The Co-operative Store System was adopted in Aspatria, taken hold of by people of the right sort, and well worked. It prospered, and proved very advantageous to the village and neighbourhood; but some of us never forget our chairman's words, "your scheme is too narrow for me," or ceased to believe that he was right.

From Aspatria we went back to Blennerhasset to advocate there the "Timothy Tarbucket" scheme, with the result of having it denounced by the schoolmaster as "a rope of sand."

In 1864, and again in 1866, we held at least one co-operative meeting in each of the following places in Cumberland—namely, Torpenhow, Bolton Gate, Ireby, Bothel, Plumbland, Blindcrake, Gilcrux, Oughterside, Hayton, Allonby, West Newton, Silloth, Abbey Town, Langrigg, Caldbeck, Hesketh-Newmarket, Dearham, Alston, Wigton, and Keswick. On such occasions one of our chief points was the story of the Rochdale Pioneers, who had begun business in such a small way that they were laughed at by neighbouring shopkeepers, who said all their stock-in-trade might be carried in a wheel-barrow. Another chief point with us was that the Cleator Moor Co-operative Society had, for one quarter, declared a dividend equal to 90 per cent. per annum on its capital. My friend and I used to hold forth on these two points in turn, so that if he told the story of the Pioneers—or "wheeled the barrow," as we used to say—I exhibited the Cleator Moor balance-sheet; and if I held forth on the Pioneers, he spoke on the balance-sheet; and if, together, we managed to speak for twenty minutes in our opening addresses, we thought we had done well. Our object was to show that the business of shopkeeping was profitable, and that if the people would take it in hand, they would reap the profits of it.

In the second co-operative campaign of 1866 we were assisted at many of the places by our chemist, a farm bailiff, a ploughman, our flax-worker from Ireland, and a stone-cutter—each doing his best as a public speaker. Discussion

Results of the Co-operative Campaigns.

was always invited, and it was interesting to observe the different ways in which the people conducted themselves in the various villages we visited. At two of the villages, we had the harmless and invigorating satisfaction of having our meetings prohibited, as far as possible, by the village grandees. At three of the villages our meetings were sanctioned by the presence of the parish clergymen. At Abbey Town there was a Mutual Improvement Society, and several practised and fluent debaters took part in the proceedings. But at most of the other villages the people did not seem much accustomed to public meetings, local preachers being among the most fluent speakers we met with. Women did not usually attend our meetings at all, or, if they did, in very small numbers.

We afterwards had the satisfaction of seeing regular co-operative stores established at Dearham, Wigton, Alston, and Aspatria.

The interest taken in these meetings may be judged of from the following notices in the *Co-operator* of December, 1866, and January, 1867, written by a contributor, at the time when the impressions were fresh, and the interest unabated:—

“Between October and December, 1866, our ‘Co-operative Corps’ (now numbering eight) has held 15 meetings in various parts of Cumberland. Mr. Foxwell’s visit to Blennerhasset was on Nov. 22. We had a large audience, for the size of the village, 80 to 100 being present. They seemed very much interested. We had a good discussion afterwards. The question of giving part bonus to non-members was ventilated—to the benefit, I hope, of some of our Aspatria friends who were present. We had Mr. Foxwell at Maryport, where a store, as yet small in size, has been established for several years. There was a good audience of perhaps 300 people. Several of our ‘Co-operative Corps’ made a few remarks. At the close, Mr. Miller Tiffin moved—‘That it is desirable that we hire capital to carry on public business;’ which was seconded by Mr. George Glassbrook, who, for his vigorous eloquence, was rewarded with loud cheers. Mr. Lawson then made some remarks on Co-operative farming, at the same time going into the questions of

The Use of a School-Room Denied.

rights to private property, and of capital being made subservient to custom. The speakers were afterwards entertained at supper at the store, as six of them had ten or twelve miles to go. These meetings were begun in the autumn of 1864, when Mr. Lawson, accompanied by Mr. Miller Tiffin, visited many villages in Cumberland, for the purpose of agitating for Co-operative stores. They met with much opposition; and being young in public speaking, and having to battle against a people 'famed for their local preachers,' they, in the opinion of the country folk generally, came off 'second best.' As experience shows, 'the yeast has been working;' and people having had time for reflection on the subject, are prepared to learn more, and oppose less. Oughterside, West Newton, Plumbland, and Langrigg were visited. At Langrigg they would not let us have the school for the advocacy of 'any such revolutionary and Utopian ideas,' so we met in a private dwelling-house. We had only one meeting at Keswick. Keswick was new ground for us. We sent the bellman round for two hours, and left small handbills at nearly every shop in the town. We had a good meeting of about 100; and all seemed very desirous to learn, while more than half the time was taken up in discussion. We sold about 30 *Co-operators*, and distributed many tracts. We held meetings at Bothel, Blencogo, Gilcrux, Blindcrake, and Dearham. The people seemed very desirous to know how to start, and asked many questions. At Dearham (where they have a store) we had a good meeting in the Methodist Chapel, the people seeming much interested. Meetings were held at Torpenhow, Allonby, and Ireby, where we had great discussion upon the Scripture view of Co-operation, after which the meeting passed a resolution in favour of starting a store in Ireby. Meetings were also held at Allhallows and Silloth. At the latter place we unfortunately held our meeting on the same evening as a temperance one, which circumstance rather spoiled both, not more than 90 being present at ours; but we intend holding another there, at which we expect a better attendance and some practical result. At present only one other meeting for 1866 is contemplated (the handbill for which

An Abbey Town Handbill.

I enclose), to be held at Abbey Town, where, as at Langrigg, they have refused the school-room; but we know that the people are well disposed towards Co-operation, and though the school is denied, the schoolmaster is energetic in getting up a good meeting for us. On the whole, I may say that the people seem much interested, and are beginning to think that there is something in Co-operation.

“Blennerhasset, Dec., 1866.”

To complete this interesting report, we reproduce the notice of the meeting:—

“*Co-operation*.—Union is Strength—True Reform—Free Education—Peace and Plenty—Justice in Trade—Better Pay for Less Toil—Happy Homes.

“Let each man find his own in all men’s good,
Then all will work in noble Brotherhood.

“A public meeting at Abbey Town will be held in Mr. Thos. Reay’s Mill, on Friday, Dec. 21, at 7 P.M. Admission free.”

The businesses of market and nursery gardening formed an important department of our establishment, and, with the application of more knowledge and care, might, I think, have paid well. In 1869 I sold the strawberries from less than an acre of land for £49. Such businesses seem to be even better adapted than ordinary agriculture, to the application of the “partnership of industry” system.”

Before selling the estate in 1871 I suggested letting it as a co-operative farm to labourers for ten years, on certain conditions, one of which was that at the beginning of the term it was to be taken at a certain valuation, and that at the end of ten years, it was to be offered for sale, so that the difference between its value at the beginning, and its value at the end of the term might be taken into account at the final division of profits between the landlord and the tenants. However, this letting the estate to a number of labourers who had no capital, never came off.

The Blennerhasset Christmas-day Festivals, the history of which Mr. Hunter relates in Chapter IX., generally con-

Intention of the Christmas Festivals.

sisted of entertainments on the Blennerhasset Farm, of music, dancing, lecturing, and discussion, interspersed by wholesome refreshments. It was felt that while great and highly educated people had their annual gatherings for the discussion of "Social Science," some unlearned and less great people might, with equal propriety and proportionate advantage, have an annual meeting at Blennerhasset for a similar purpose. Several lecturers were usually advertised to lecture at certain hours of the day on such subjects as Temperance, Health, Phonography, Robert Burns, Woman's Rights, Capital Punishment, the American People, Agriculture, Natural Philosophy or Co-operation, discussion being always invited on each subject lectured upon.

We had three large granaries, the smallest of which would hold several hundred people seated, and in the largest of which, I think I have seen present, at one time, about a thousand people, and this at a Christmas festival. We were able to use the three granaries simultaneously from about 10 A.M. till 9 P.M., one for music and dancing, another for lectures and discussion, and the third for refreshments and conversation.

There was a great advantage in having the counter-attractions of music and dancing going on at the same time as the lectures, in a separate and distant room; for by this means remarkably attentive audiences were obtained at the lectures, no one going to them, generally, except those who were anxious for instruction.

Dancing was usually kept up almost all day; and the festivals seemed to be much enjoyed generally, by a great variety of working people, with whom Christmas-day was always a holiday, and almost the only one, excepting Sunday, in the year.

The first of these gatherings took place in 1866, and it was, I think, the most interesting, not only because it was the first, but because it was the most peculiar; for it was the vegetarian festival!

At that time I had been a vegetarian for five years, having become one in the following way:—On the 4th of October, 1861, an emissary of one of the numerous societies in which

Vegetarian Experience.

my father was interested, or which were interested in him, came to luncheon at Brayton, and, on my offering him a mutton-chop, said he was a vegetarian, and recommended his system of diet to me. As I thought the change of diet might benefit my defective hearing, I determined to give his system a trial, so, after eating one more mutton-chop, I became a vegetarian.

After about a year's abstinence from flesh meat, I thought vegetarianism agreed very well with me; and I began to read, with much interest, some of the publications of the Vegetarian Society, and such books as Graham's "Science of Human Life," and Smith's "Fruits and Farinacea." Then I thought I saw that the vegetarian theory was true; and, as my experience seemed to confirm its truth, I continued the vegetarian diet.

The Cumberland people, as most English people have, had a prejudice in favour of roast-beef; and when in 1863 I tried the experiment of feeding the farm labourers on vegetarian food, statements were made about the "nourishment" of flesh compared with that of vegetarian food, which I think I knew to be absurd, but which seemed to be really believed.

I wished to show my neighbours what a variety of excellent food could be provided, at small cost, without having recourse to the flesh of animals, to such animal products as eggs, milk, butter, and cheese, or even to such things as pepper and salt; so for Christmas, 1866, I got up a vegetarian dinner, to which several hundred people came.

But we were not then experienced in the management of large dinners; and, with the exception of the chemist, who was a vegetarian like myself, perhaps our people did not enter heartily into what they probably considered the strange and unbecoming experiment of a Christmas feast without meat. Though the first comers to the dinner fared well enough, things soon fell into a state of confusion and untidiness that was distasteful to our guests; dishes did not continue to be carefully served, and vegetable soup, that would have been liked if taken hot, was presented cold or tepid. I confess, indeed, to bad management; and that I had not

Cheapness a means of Morality.

before realised the importance attached by my neighbours to the *temperature* of their food. Whatever may have been thought of the 1866 Christmas festival, as a whole, the refreshment part of it did not give general satisfaction. It was unfavourably noticed in all the local papers, and eventually ridiculed in *Punch*.

Still it seems to me that the cheapness of a vegetarian compared with a flesh diet, ought to recommend it to the poor for their own sake, and to the rich because it leaves at their disposal more wealth for other useful purposes. But costly food seems to be commonly regarded as specially advantageous; and probably the tendency to so regard it will continue as long as hunting for private wealth is, by common consent, the great game of the world. For as none of us can think of any real good in wealth except on account of the advantages it can buy, we easily fall into the error of supposing that things are *really good* in proportion to their costliness; and of taking for granted that costly food is one of the advantages on which wealth *ought to be* spent, because we see it to be one of the things on which wealth *is* commonly spent.

The average cost to me of each of the five Blennerhasset festivals of Christmas, 1866, 1867, 1868, and 1869, and of July, 1870, was about £50. And I look back upon that expenditure with satisfaction, as having been incurred with a view of affording a good deal of pleasure to a good many people, and in a way that might be instructive.

CHAPTER VII.

PERSONAL INCIDENTS.

DURING the very earliest days of my farming, one afternoon I called together a lot of the labourers, and read the whole of Shakespere's "Macbeth" to them at a sitting. They all went to sleep except one. I also read to them occasionally from "Talpa, or the Chronicles of a Clay Farm," and sometimes from the *Co-operator*. My hearers listened as long as they could.

I remember being told, long ago, by a well-known agricultural neighbour, that I should never make money by farming, because I had too much to begin with; and, reader, if you are a young man, in easy circumstances, without an agricultural training, and confidently propose to make your living as a British farmer, I venture to say—probably you won't do it, but try. A writer on agriculture somewhere remarks, that if you buy five per cent. too dearly, and sell five per cent. too cheaply, your farming profit is gone; and yet what a trifling difference there seems to be between a guinea and a pound. To be a money-making farmer, one must be a trader, prepared for "the higgling of the market," and know the value of a shilling. The story is told of an old Scotchman who, when reproached for having taken in a young neighbour, said "it was good for the lad;" and there are always plenty of people ready to *do good* to the lad in the same way.

I quite understood that—

"He that by the plough would thrive,
Himself must either hold or drive;"

and in the early days of my farming, when a good deal of such work as shifting soil with horses and carts had to be done, I found by experiment on one occasion, that though I was

Going to Law with a Drainer.

only a feeble "navvy," my staying among a lot of men that were working with horses and carts increased the amount of work done at the rate of ten shillings a-day.

I do not profess to understand draining ; but I suspect many professed drainers have a great deal to learn about it yet. If you have to employ drainers, employ honest people if possible. When I began farming I was in a great hurry to get all the wet land drained as soon as possible, and, with this end in view, I employed a professional drainer, at so much a-week, to get men and drain a great part of the farm in a short time. He soon had about a hundred drainers at work on the farm, and a great deal of draining was done in a short time. But he and his men had not long left the place before we discovered that many of the supposed drains of their last few days' work were, in reality, no drains at all, but only rows of moved earth, which had been dug out to the depth of a few inches and put back again without any tiles ! An old stager might have said it was "of no use throwing good money after bad," but I thought the head drainer ought to be shown up ; so I summoned him to the County Court for the amount of the estimated damage. The judge likened the case to that of a groom's accidentally throwing down his employer's horse and breaking its knees ; and I, in reply, pleading my own cause, likened it to that of the groom's taking the horse to the smithy, getting one shoe put on, and charging his employer for four. I was non-suited.

Land is sometimes extravagantly drained. A good deal of the draining on my farm was carried out by a trusty, old-experienced drainer, who had acted as foreman drainer on the Brayton estate as long as I could remember. When he was about to drain one of my fields five feet deep and ten yards apart—our usual style of draining on the Blennerhasset farm at that time—I suggested to him that, as the subsoil was of a porous nature, the drains should be tried twenty yards apart, instead of ten. This suggestion was adopted ; so it happened that an inexperienced man had his field sufficiently drained at about half the cost that a trusty and experienced drainer was about to involve him in ; for,

Association not always an advantage.

to this day, I have never heard of any complaint that the field was insufficiently drained.

Do not expect to gain anything by joining an association of neighbouring land-owners and farmers, to enable you to drain your land. One of the first things I did in 1862 was to join such an association, which proposed to secure the means of properly draining some scores of acres of meadow land, in the hands of, and belonging to, above a dozen different people, by deepening and widening an open main drain called the Kirkland Cut. Each person that joined the association was to contribute to the necessary funds in proportion to the quantity and quality of his land that would be benefited by the undertaking. I think I had scarcely ten acres to be so benefited; but, to the best of my recollection, I was assessed by the engineer of the association for about 14 acres, at the highest rate per acre. Those of the benefiting land-owners who refused to join the association contributed nothing towards the undertaking, and were probably glad of the opportunity of having their property improved at other people's expense. Then came endless bother, lasting over a period of several years. I was one of the committee of management; and I have a distinct recollection of many weary committee meetings held at various hours of the day or night, sometimes in a public, and sometimes in a private house, for hours together, often accomplishing very little. Then our contractor failed to give satisfaction; the engineer seemed to play into the contractor's hands; the cut was not deepened enough; and we had one or two County Court trials about it. The very name of the Kirkland Cut became odious to me; and I saw afterwards that I might have drained my meadow land more cheaply and satisfactorily by cutting through my own ground without joining the association at all.

Some people run great risks in gratifying their feelings, as the following stories may illustrate. In the early years of my farming, I brought from a distance a well-recommended shepherd, who understood his business and was a trustworthy man, as far as I know, but had the misfortune to be an Irishman, displacing a Cumbrian. One day one of the

Cumbrian Hostility to Strangers.

sheep was missing, and soon afterwards its skin was found in the neighbouring fields with the entrails neatly wrapped up in it. Somebody had neatly butchered the sheep and taken the mutton ; but *we never knew who*.

The Irishman did not stay long with us after that. Years afterwards, we had occasion to employ a Highlander as shepherd, the Cumbrian being again displaced, and one morning, while this Highlander had the care of my sheep on turnips, it was found that somebody had during the night cut the sheep nets and hunted the sheep with a dog, leaving one of them dead in a pool of water ; but we never knew who had done it.

Those who act through others are said to act themselves ; and I have known an employer have to take the consequences of his agent's indiscretion ; but I have also known an agent called upon to take a share of the responsibility for actions in which he was simply carrying out his employer's wish. On one occasion my controlling agent had discharged a labourer during my absence, and the labourer afterwards brought the case as a grievance before the Blennerhasset Parliament when I was présent ; and though I believed the agent had simply done his duty in the case, some of my friends thought I did not say so emphatically enough ; and the fact is I was afraid the labourer might destroy some of the farm property to gratify his feelings, if he felt that he owed me a whole and undivided grudge. It is not always easy to draw the line between prudence and cowardice ; but I believe I have been too cowardly.

We had a system of letting cottages by auction, and requiring prepayment of rent. This system saved trouble, and secured the rents ; though perhaps it did not always secure what are called desirable tenants. After the new farm buildings were ready for use, the old ones were turned into cottages for the labourers, and some twenty dwellings were added to the village. These were let thus :—The day being advertised, the auctioneer took his stand on a slight elevation, and read the conditions of letting. These contained clauses against the keeping of hens, pigs, and

Cottage-Letting by Dutch Auction.

anything of the kind that might lead to quarrels or pilfering; and stipulations for prepayment of the weekly rent, fourteen days in advance, and that one week's notice should be sufficient on either side. These being read, the question was asked, "Who will give for this house four shillings a-week—3s. 10d.—3s. 10d.," and so on, till some one called out, "here," when the house was knocked down to him or her. It was urged against this system of periodical lettings, that it gave rise to much dissatisfaction, and frequent changes. A spiteful neighbour, whose hatred exceeded a penny a-week, might take his or her enemy's house at a penny a-week above the old rent; and if the supply was small, the ousted party would have to repeat this on some other neighbour; and, if himself of a cleanly turn, he might be compelled annually to leave his tidy house for one made dirty by some lazier cotter. This system was defended, because, by it, each man settled his own rent, and could soon get a better house if the one he had, proved unsuitable. Public feeling, however, was against it; and finally an end was put to it.

In June, 1867, Brayton had ceased to be my residence; and I afterwards travelled a great deal, and was, consequently, even less than formerly upon or near my farm. In 1867 I was in France; in 1868 in Italy and America; in 1869 in America; in 1870 in America, France, Belgium, Germany, and Italy; and in 1871 in Italy, Switzerland, and France. But I continued to hold the farm, with a view to settling down on it before long, and, as my own head man, looking closely after it myself. In the meantime I was willing to test the soundness of our establishment's constitution by trying how the farm got on without my constant presence.

Having taught ourselves much in previous years about growing potatoes with artificial manure, in 1871 we had above a hundred acres—about a quarter of the farm—in potatoes. In the autumn of 1871 the well-known potato disease, that first appeared in the British Isles in 1848, was worse in Cumberland than it had been for many years. It is difficult to estimate the precise loss occasioned on the farm by this disease, but it certainly destroyed a very large

Relinquishment of Farming.

number of our potatoes ; and our potato crop of 1871 was probably not worth, per acre, half that of 1870.

About the end of 1871 it seemed clear that my farming was very far from being remunerative, and from giving prospect of becoming so. All, or nearly all, prospect of my ever living on the farm had vanished ; and I had already had ten years' experience of the pleasure of holding a farm without living on it. Through the farm I had enjoyed much, learned something, and, I hope, been useful to some of my neighbours. I had had a pretty good spell of farming, such as it was, so I offered the Blennerhasset estate for sale, and on the 2nd February, 1872, it passed from my hands to those of my brother (Sir Wilfrid) at the price of £30,000, the fixed machinery being taken at the valuation of £847.

The continuation of the narrative, except where otherwise indicated, is by Mr. Charles D. Hunter, who conducted the agricultural experiments, and managed several departments of the establishment.

Public Good Expenditure.

CHAPTER VIII.

PUBLIC GOOD DEPARTMENTS.

“PUBLIC GOOD” was a term used under which to class all expenditure incurred for the public advantage, whether the recipients were workers on the farm or not. The Free School, Free Library, and other kindred devices, were samples.

Between 1866 and the spring of 1872, £1,301 12s. 10½d. were expended in one way or another, on what we called “Public Good Account.” The totals are as follow:—

| | |
|--|------------|
| 1. Co-operative Meetings, | £2 4 10 |
| 2. Agricultural Experiments, | 207 16 10¼ |
| 3. Free Library and Reading Rooms, | 339 11 9 |
| 4. Free Schooling, | 298 17 11½ |
| 5. Free Bath Room, | 7 0 7½ |
| 6. Noble Temple, | 225 0 0 |
| 7. Public Assistance, | 317 14 0 |
| 8. Festivals and Trips,* | 338 9 11½ |

| | |
|--|---------------|
| Deduct— | £1,736 15 11¾ |
| Library and Reading Rooms still in use, £289 2 6 | |
| Sundry Sales, 146 0 7¼ | |
| | <hr/> |
| | 435 3 1¼ |

Net Expenditure, £1,301 12 10½

I. The expenditure on co-operative meetings, though least of the eight items, represents—as has been seen in a previous chapter—no small amount of labour. Many, however, of the early expenses do not appear in the above statement, as they were incurred before the days of account-keeping.

These co-operative lectures, or rather “talks,” were the

* This Section is explained in a separate chapter.

The "One Rule" of the Free Library.

outcome of enthusiasm which saw in the principle of co-operation a cure for nearly all the social ills. At first the farm servants had to bear the weight of this enthusiasm, and with what effect we have already seen. Afterwards it led to our holding numerous public meetings in 1865 and 1866 in the surrounding villages and towns.

II. Agricultural experiments, though a very considerable item, was an expenditure that bore immediate fruit in the working of the manure department, and also (though less than might have been expected) in the management of the crops. The results of some of these experiments were sent to Professor Volcker, of the Royal Agricultural Society of England, and by him published in the Journals of the Society. Many on potatoes formed the subject of a recent prize essay.* Some of the experiments were also published from time to time in the agricultural papers; and others were reported to the Wigton Farmers' Club.

Many of the experiments are given in other chapters, but only the more important—many others of equal interest on oats, barley, potatoes, carrots, and Swede turnips not being sufficiently prepared for publication.

III. The Free Library and Reading Rooms were perhaps the most useful and successful of all our attempts at public good. The Free Library was begun in the end of 1866, when Mr. Lawson placed about 300 volumes in the laboratory of the farm, and had them numbered for convenience in lending. He disliked many rules, which generally make many difficulties; so that only this one rule was resolved upon—"That after one month's use a fine of one penny per week will be charged." A copy of this rule was pasted into every book, and the following regulations printed in the catalogue:—

"The books are lent out free of charge for one month to any one approved of by the Librarian. A fine of one penny

* It appears in "The Transactions of the Highland and Agricultural Society," Vol. V., Fourth Series. 1873. It was awarded a prize of £20.

The Written and the Unwritten Law.

is charged for every week, or portion of a week, during which it is retained beyond the month.

“The Library is open on Monday evenings, from 7 to 9, and, as far as convenient, daily from 9 A.M. to 6 P.M.

“Persons sending for books are recommended to write a list of the numbers and titles of several; as the one book wanted may be out.

“It is earnestly requested that the books be kept clean, that the corners of the leaves be not turned down, and that they be kept from the hands of young children.”

These made up the entire *written law*, but the unwritten law, which was simply the Librarian's will, practically relaxed the written law so far that schoolmasters, preachers, and those using books of great size or requiring much study, were generally remitted their fines. Readers, too, from beyond four miles, were mercifully dealt with, but the near, and the purely novel readers, were fined so surely, that in one year nearly £3 was thus collected.

The first loan bears date December 13th, 1866; and by the end of 1867 fifty-nine individuals had made use of the library, and some 200 loans had been made. Of its further progress the following figures will give a better idea, remembering, however, that the earlier figures, though very close, are not mathematically accurate:—

PROGRESS OF THE FREE LIBRARY.

| | 1867. | 1868. | 1869. | 1870. | 1871. | 1872. | 1873. | Total |
|--|-------|-------|-------|-------|-------|-------|-------|-------|
| Number of Loans during the year | 200 | 377 | 966 | 1959 | 2340 | 1210 | 473 | 7525 |
| Number of new Readers | 59 | 58 | 108 | 156 | 155 | 97 | 27 | 660 |
| Greatest number of Loans at any one time during the year | 33 | 52 | 105 | 145 | 171 | 100 | .. | .. |
| Volumes for Lending | 500 | 610 | 780 | 986 | 1275 | 1661 | ... | .. |
| Volumes for Reference | 50 | 53 | 55 | 82 | 90 | 93 | .. | .. |
| Total Volumes in Library | 550 | 663 | 835 | 1068 | 1365 | 1754 | .. | ... |

Removal of the Free Library.

In 1872, after the removal of the library from the farm, the number of loans fell off very much—1871 showing 2340, and 1873 only 473 (till October 6th, 1873). This was foreseen; and both by petition and a resolution of the weekly Parliament, Mr. Lawson was requested to leave the library at Blennerhasset, in charge of a committee or otherwise; but to this he did not see his way. It was urged that Blennerhasset was on the whole very central for a library, an analysis of the localities of the readers made in November, 1871, giving the following result. Number of readers from—

| | |
|-------------------------------|------------------|
| Blennerhasset and Baggrow, . | . 41.8 per cent. |
| Aspatria and to the west, . | . 36.1 „ |
| Torpenhow and to the south, . | . 6.1 „ |
| Mealsgate and to the east, . | . 16.0 „ |
| | <hr/> |
| | 100.0 |

The removal, being made to the east, was away from the best reading district, which lay to the west; the loss, however, has not been great, as Miss Lawson gave a free library to Aspatria some months before the removal of Mr. Lawson's.

The additions to the library were chiefly made by the writer hereof, who had charge of it; and many of the books were purchased at Glasgow in his half-yearly visits north. At first the additions were chiefly of the popular science stamp, such as "Faraday's History of a Candle," and "Lardner's Common Things"; but latterly the number of novels was greatly increased. But of these only the better class were added, such as the works of Dickens, Scott, Stowe, and Mulloch. But even after this addition, it is wonderful what an amount of solid reading was gone through. The following analysis of 2156 loans in the winter of 1870-1 will compare favourably with that of any town library. An analysis is also given of the library books themselves, as they stood in 1870:—

Burning of Paine's Works.

PROPORTION PER CENT. OF THE DIFFERENT CLASSES OF BOOKS IN THE LIBRARY AND OF THOSE BORROWED.

| | Per cent. in the Library. | Per cent. in the Loans. |
|-------------------------------------|------------------------------|----------------------------|
| Science and General Information, . | 31.2 | 13.34 |
| Religious Works, | 10.6 | 5.93 |
| Essays and Miscellaneous, | 8.7 | 7.04 |
| Biography, | 8.0 | 7.60 |
| History, | 6.5 | 2.46 |
| Travels, | 4.3 | 4.60 |
| Poetry, | 3.7 | 2.32 |
| Fiction, | 14.4 | 36.91 |
| Juveniles, | 9.4 | 19.80 |

This shows only 37 loans of fiction in the 100; and even if we add the juvenile circulation, of nearly 20 per cent., we get only 57 as compared with 78.4 in Boston (America), 73 in Liverpool, and 55 in Manchester. Religious works show also comparatively a high per centage. These were of all creeds, Mr. Lawson wishing to give all sides; choosing many himself, and purchasing the choice of others, so that Evangelicalism, Rationalism, Romanism, and Scepticism were all represented. Paine's works were also in the library; but a friend induced Mr. Lawson to withdraw them for seven years. Paine's works were at the same time condemned to be burnt; but circumstances delayed the execution for two years, and not till Christmas, 1871, was the sentence carried out. For some days before, it was well advertised; and both his defenders and detractors were invited to discuss his merits and shortcomings at the fire. On the appointed day Mr. Lawson gave a sketch of his life and times, and from an American publication, read a long list of testimonials of Paine's political services and character. Then the Dissenting minister of the place spoke against him, after which a friend from Carlisle spoke in favour of his works, which were then burnt by Mr. Lawson on the village green.

In 1870 a catalogue of the library was published; but out of 400 copies only about 70 have been sold, although the price—4d. per copy—was a little under the cost-price of the

Free Library Management.

printing alone. The cost of the library varied between £20 and £30 per annum, including additions; but of the tear and wear on the books, little can yet be said; as the loans still bear too small a proportion to the number of the volumes. Some of the books stood 30 loans before rebinding, and others only 10 or 12. The actual losses were slight, being less than one in 600, and occurring chiefly in the juvenile division; and, upon the whole, our experience of a free library was a highly favourable one. But the Librarian found that the least carelessness on his part reacted at once on the borrowers, and that certainty of detection was far more powerful to keep things right than the magnitude of the penalty. Some of the more careless readers were frequently suspended, but only temporarily, and in such a way that they should feel that after a month or two the Librarian would be glad to see them reading again.

The overdue list was examined at least every second month, and by means of the halfpenny post a circular was sent to the defaulters, specifying the amount of the fine and its cumulative character. The system of entry made this an easy matter, the loan book being ruled in four columns; the first for the date of issue, the second for the number of the reader, the third for the catalogue number of the book, and the fourth for the date of return. The vacant spaces of this fourth column showed at a glance the overdue list. Besides this, each book had, pasted into it, a small two-columned fly leaf, on which was entered the date of the loan and the number of the reader. By reference to this, every one borrowing a book could see at once when it was due, and no reader could offer excuses or plead forgetfulness for non-observance of the one rule. This system I can recommend as the best of several that were tried. Besides the Blennerhasset Free Library, Mr. Lawson made some attempts to establish others, and offered both to Wigton and Maryport a sum of £50 for this purpose; but neither town accepted the offer.

Free Reading Rooms were also established, the first being at Blennerhasset, which was supplied second-hand from the farm; but as no one had any special charge of it, the com-

Free Reading Rooms Established.

plaints in the Parliament were constant; and at length it was handed over to a manager elected by the Parliament. The managership was, however, no sinecure; and several persons, after accepting the office, speedily resigned it, as the mis-carriage of a paper subjected them to much unpleasant criticism in the Parliament; and this office was, in consequence, more than once a-begging. The Reading Room did, however, pretty well under the management of the village schoolmaster.

In October, 1871, Mr. Lawson proposed that £45 a-year be allowed by the establishment for the support of six reading rooms in six villages. This, of course, met with some opposition in Blennerhasset; as its adoption would reduce the Reading Room supplies from about £12 per annum to perhaps £7; but it was finally carried by fifteen votes against nine. Some six conditions were also annexed to the offer, the most important of which required that the reading rooms should be open at least five hours daily, *seven* days in the week, to all comers, and that any paper not objected to by Mr. Lawson should be admitted to the reading room.

Meetings were now called in the six villages proposed for the grant, Joseph Rickerby and Edward Tiffin undertaking the advocacy of the scheme. But two of these villages (Plumbland and Bothel) rejected the offer, probably because of the conditions mentioned above, some of the chief men fearing the Sunday opening of the reading room and the introduction of sceptical papers by Mr. Lawson.

The other four villages accepted his offer, and received 2s. 6d. per week during 1871-72-73, the rest of the grant going to pay a messenger and some other small expenses incurred by Mr. Lawson for the better supervision and management of the various rooms. Each village was also expected to accept this 2s. 6d. a-week as an aid only, Mr. Lawson's intention being to pay for the *freedom of the rooms to all comers*—for at least one of the villages already possessed a reading room; but such reading rooms are generally only open to subscribers—and it was hoped that this 2s. 6d., supplemented by some of the pennies a-week from the sub-

Free School proposed.

scribers to the old subscription reading rooms, would suffice to support a good one, which should be closed against no one on account of his or her poverty. The four accepting villages were Aspatria, Blennerhasset, Bolton Gate, and Ireby; and a pretty large choice of papers was managed by the four taking some jointly, their circulation being managed by means of the weekly messenger, such papers thus lying one week in each village. Mr. Lawson supplied also some American papers, among which may be mentioned "The Nation," "The Boston Investigator," "The Communist," and "The Circular."

IV. The charge for Free Schooling, £298 17s. 11½d., represents the cost of books and teaching for nearly five years. Cumberland, as a county, is pretty well off as regards education; free schools are not uncommon, and even where such do not exist, much free schooling is obtained, the gentry paying the school fees in some instances. In 1866 Blennerhasset was possessed of a schoolhouse of fair size and a teacher of much ability, but the building of many cottages, and the influx of many people to work at Mechi Farm, would have rather strained the school accommodation, had compulsory education been in force. Mr. Lawson had for a long time the responsibility of much of this; and finally, after some consideration, addressed the following letter to the weekly Parliament—he not being able to attend in person:—

"April 9th, 1867.

"Let this assembly fairly state how much money it wishes to be spent in teaching all comers for nothing. And as I will provide any reasonable sum of money that is thus publicly voted, I think those who hear this letter will be responsible for withholding free instruction from the people if they remain silent on the subject.

"WILLIAM LAWSON."

At this time the chief speakers were the schoolmaster, a neighbouring farmer, and a railway overseer. These three

An Ideal School for Ideal Children.

were the independent opposition speakers, whilst the "official" speakers were Mr. Lawson, the chemist, and the clerk, and latterly the farm bailiff and the timekeeper.

As might have been expected, "a reasonable sum" was the first subject of inquiry; £20 was proposed, and then £80, when the chairman hinted that the latter was nearer what would be deemed reasonable; and next week when the subject was again being talked over, the proposer of the £80 brought forward his scheme, of which the following is a condensed statement:—

| | | | | | | |
|------------------------------------|---|---|---|-----|---|---|
| A Reading Room, | . | . | . | £30 | 0 | 0 |
| Library expenditure, | . | . | . | 7 | 0 | 0 |
| Lectures and Diagrams, | . | . | . | 10 | 0 | 0 |
| Parliament expenditure, | . | . | . | 5 | 0 | 0 |
| Day Schooling on half-time system, | . | . | . | 6 | 0 | 0 |
| Night Schooling, | . | . | . | 22 | 0 | 0 |
| <hr/> | | | | | | |
| Total, | . | . | . | £80 | 0 | 0 |

This, however, Mr. Lawson considered not radical enough, and as meantime he had advertised for a schoolmistress, there was some lively debate, the schoolmaster thinking the whole thing uncalled for, and Mr. Lawson painting an ideal school with short hours, no rod, and children as hungry for learning as for bodily food. The £80 resolution was then carried, and in a few days Mr. Lawson wrote to the schoolmaster as follows:—

"Brayton, Tuesday, May 7, 1867.

"Dear Sir,

"Please let me know at your earliest convenience—to-morrow if possible—the lowest sum of money per week that would induce you to teach reading, writing, arithmetic, or needle-work, or any or all of these branches of learning, for thirty hours per week, or for as short a time as the pupils may desire, to all persons who choose to avail themselves of free instruction.

"If, by a diminution of the number of hours, or of the number of branches required to be taught, or by a diminu-

Children Voting their own Lessons.

tion of the number of both, you could teach for a considerably less sum of money, *I trust you will not fail* to suggest such diminution or diminutions."

To this the teacher at once replied, offering three alternatives.

"I agree to the following terms, viz. :—

"1st. To teach 'all comers,' exclusive of those whose education is paid for by others than their parents, and including all the rest of the school, for 21s. per week; or

"2nd. To teach 'all comers' not now attending, including those already in attendance, whose parents, in my opinion, are either unable, or can with difficulty only, pay for their education, for 10s. 6d. per week; or

"3rd. To teach 'all comers' not now attending, including those already in attendance, whose parents are quite unable to pay for their education, for 7s. per week."

This correspondence being read at the next Parliament, the discussion turned chiefly upon the question of who should be judge of "a parent's ability to pay." The schoolmaster claimed that he could best judge of this; but the farmer thought Mr. Lawson, who paid the fees, should choose the recipients. The teacher then offered to work on the scheme before brought forward by the chemist; but Mr. Lawson would have nothing short of free instruction to all comers; and finally it was carried "that none of the teacher's proposals be accepted." This was on May 14; and after much talking at several meetings, the question dropped.

One good result that followed was the establishment of a night school, taught by volunteer teachers. Four offered themselves—Mr. Lawson, the farmer, the railway overseer, and the chemist, but the two latter alone proved of real service, Mr. Lawson soon going abroad. A female teacher was also engaged for the night school, and for the first year this succeeded very well, the great majority of the day scholars attending also the night school, and seemingly enjoying the novel excitement of *voting their own lessons*, a plan adopted by the chemist from American models.

A Schoolmistress Elected by Ballot.

Meantime the subject of a free day school had become more of a public question, the village class leader of the Methodists taking it up, and advocating (June, 1867,) a free day school, where knitting and sewing should be taught by a mistress. He also blamed Mr. Lawson for letting the matter go to rest again; but Mr. Lawson replied that it was the people's fault, who had not taken up his offer. The class leader's motion was then adopted by five votes for, and none against, and the meeting following this, had to be held in a dwelling-house, as admittance to the school-house (the usual place of meeting) could not be obtained. Mr. Lawson now advertised again for a female teacher; and the meeting passed four resolutions, copies of which were to be sent to all applicants. These were as follows:—1. That the teacher have a holiday on Sunday. 2. That the teacher be required to work forty-eight hours a-week. 3. That the teacher be not required to work after mid-day on Saturday. 4. That the teacher be a first-rate dressmaker and worker of a sewing machine, who can teach reading, writing, arithmetic, and singing to grown-up people. It is probable that the proposer of this resolution had not at that time a very distinct idea of the qualifications of "a first-rate dressmaker." No. 2 was to be thus divided—two hours of teaching in the forenoon, two in the afternoon, and two in the evening, the remaining two at the sewing machine or dressmaking. Practically, the latter never came to much; though a machine was purchased and occasionally worked.

At last, after much advertising, writing, and discussing, the decision was narrowed down to two candidates, one at Inverness and one in the neighbourhood, and on a ballot being taken, the Inverness candidate polled fourteen and the home candidate four votes. The former was then engaged, and by the middle of November, 1867, a free day school was opened.

But previous to this, it had been found necessary to transfer the night school from the school-house to a building belonging to Mr. Lawson, three rooms of which were found necessary to accommodate the separate classes; so that when the new day school was begun, rooms, desks, and

Village Evening Lectures.

books, were all in readiness. It had also been found necessary to forbid the day scholars from attendance at the night school, the older pupils complaining of an insufficient teaching staff. The attendance in 1868, the second winter, averaged about twenty males and twenty-five females; but in 1869 it fell off considerably, and in 1870 the chemist, now the only teacher of the original four (the railway overseer having removed) re-admitted the day scholars to his class. This he held now only once a-week, and as there was already abundance of opportunity for learning the three R's, he made biography, geography, and science the subjects for teaching.

The geography of Europe was gone through, each country being linked with the name of one of its famous men. France suggesting Palissy, and Spain Columbus. England was treated in the same manner, but by counties; and afterwards its history was gone into. After the lessons were over, a powerful binocular microscope was brought out, and crystallisation and the structure of insects and plants illustrated, the polariscope being also made use of for this purpose.

One evening the printing press was the only lesson, and by means of the small apparatus from the farm, each of the twenty or thirty children present "composed" his or her own initials; and afterwards each printed a copy for himself.

Occasional lectures were given in the Free School-room—the schoolmistress giving one on woman's rights; the chemist several on chemistry and allied subjects, illustrating them by experiments; the clerk giving one on the steam engine; and a labourer one on what he saw in the Mauritius.

During the greater part of 1868 and 1869 Mr. Lawson was in America; and from his letters the schoolmistress drilled her pupils in the geography of America, Mr. Lawson having suggested an examination on this subject. But on his return, other things engaged his attention; and his stay was so brief that the examination was neglected.

The free day school had generally about seventy names on its roll, but the average attendance was about fifty, though

The School Teacher and the Village Parliament.

much less in summer. The yearly cost varied a little, but the following for 1869 is a fair average:—

COST OF FREE SCHOOL IN 1869.

| | | | |
|--|-----|----|---|
| Wages to Teacher of School, | £40 | 4 | 0 |
| Fees to another School, | 1 | 6 | 0 |
| Coals, | 3 | 10 | 6 |
| Books, | 13 | 6 | 0 |
| Rent, | 10 | 8 | 0 |
| One-fifth cost of painting, &c., | 0 | 8 | 5 |
| Wear and Tear on Sewing Machine, Forms, Maps, &c., at 20 per cent., | 5 | 2 | 6 |
| Total Cost, | £74 | 5 | 5 |

The Inverness lady who had been elected school teacher, by ballot and universal suffrage, gave pretty general satisfaction; and, for the comfort of teachers who fear being placed under a rural School Board, it may be well to give some details of the few occasions, when an irresponsible and open-to-all village parliament, was called upon to criticise her proceedings. First, as to her salary, which was, of course, fixed before she came; but at that time the amount of it in nowise affected the bonus-money of the workers. About a year afterwards it was raised £5, and a holiday gift was also added. This, however, was done by Mr. Lawson, and what was frequently called “the inner house” or “privy council,” which consisted of the bailiff, the chemist, the two clerks, and Mr. Lawson when at home. But even when, in 1870 and 1871, the cost of the free school was a direct burden on the workers’ bonus on wages, no proposal was ever made to reduce her salary, or in any way curtail her perquisites. On the contrary, the weekly parliament voted at least one of her annual holidays (extending over some weeks); and on one occasion, when she had suspended some children, and the parents brought the case before the parliament, that assembly discussed the affair two nights, heard the parents and then the teacher, and ended the matter by passing a vote of confidence in her.

After this, things went on quietly in the free day school

The Free School to be given up.

till December, 1869, when the public were again called upon to decide between the Inverness lady and a home candidate. The latter was in this case the son of the late schoolmaster, who had succeeded his father some months before. The question was asked by a neighbouring lady who had long taken great interest in the Blennerhasset British School, and who now wanted the people to decide whether they would prefer, as teacher of the Free School, the present British School teacher (assisted by his mother or sister) or the present Free School teacher. The question was keenly debated for some weeks; and at last a ballot was decided upon, the suffrage to be universal (to all above fourteen years of age), as usual. Then occurred, without exception, the largest muster of voters ever seen at the village parliament. The excitement was great; and so important was the issue deemed, that the Dissenting minister of the place and other local dignitaries acted as poll clerks and counted the votes. These numbered 157, the Free School teacher receiving 92 votes, and the late schoolmaster's son 65.

In the discussions upon this question, the parliament passed several resolutions, declaring that two schools were necessary for the village, and advising the continuance of both. These induced Mr. Lawson to make an attempt to uphold both schools, by an arrangement with some of the supporters of the old school, and with such success, that at one time the Dissenting minister of the place provisionally accepted an offer from Mr. Lawson of about £70 annually for the support of both schools. This, however, came to nothing; and things continued much as before, till the autumn of 1870, when the Education Act came under Mr. Lawson's notice.

This new Education Act proved the next and the last disturbing force against the free school; for soon after it became law, Mr. Lawson intimated to the people that now the Government had undertaken to educate the nation, he did not think it necessary that he should bear the sole expense of the present free school; and he announced his intention of discontinuing it after the end of 1870. The weekly parliament now began to discuss the Education Act;

Attempt to form a School Board.

and at last it was decided to call the necessary meetings for the establishment of a district School Board; but the law is proverbially slow; and before the necessary forms were gone through, Mr. Lawson's notice expired; and in his absence it was with some difficulty that an extension of time was obtained. It proved, however, of little use; for though a School Board was first informally and then formally agreed to, "my Lords" evidently thought our district too small; as they answered us (Dec. 1870) in a long circumlocutory printed paper, with many paragraphs, that led us away from the following one, which contained the gist of their answer. "The returns referred to in Section 8, have been called for from every Parish (as defined by Section 3) in England and Wales. Till these returns are received and examined, the Education Department cannot determine what local inquiry may have to be made into the existing school provision of any parish; nor will they be in a position till the results of such inquiry are reported to them, to consider the question of the formation of a School Board, either for the parish by itself, or as part of a larger district. Any expression of opinion on this subject would, at present, be premature."

The upshot was, that we could do nothing but make a rate, to pay the expenses of the official whom the law had compelled us to invite to our bootless meetings. I think, however, at this distance of time, that "my Lords" were right, and that our district was too small. We pestered them, {however, with a few more letters, which they duly answered in a delightfully ambiguous way, that both amused and provoked their village correspondents.

Thus ended our free school in the spring of 1871, after nearly four years of useful work. Its stoppage left a gap in the educative facilities of the village; but steps were taken by the late Miss Lawson, which practically converted the existing British school into one free to all those children in the village whose parents could not afford to pay for them.

V. The Free Bath Room, though but a small charge, represents a great amount of discussion and many propositions in the weekly parliament. The Flax tanks, the river

A Free Bath Room instituted.

Ellen, the head race and the tail race, were all proposed, discussed, and rejected. Finally, in the winter of 1868-9, it was proceeded with; and a small corner of the turnip house was walled off, and fitted up with a spray, a douche, a wooden plunge bath, and a packing trestle. When finished, it was more largely used than had been anticipated, especially in the summer months. The great fire in August, 1871, destroyed it, but its re-construction was intended.

VI. The expenditure for Noble Temple has reference to a piece of land in Aspatria which Mr. Lawson gave, on certain conditions, to a Public Hall Company, in which he himself was a large shareholder. The most important of these conditions was the right to the use of the hall every Sunday for thirty years. This he stipulated for, having been unable, before, to obtain the use of a place of meeting in Aspatria for the purpose of scientific lectures on Sunday. Noble Temple* is now built; and several of the intended lectures have already been given.

VII. The public assistance items include various small expenditures, some of which were voted by the Blennerhasset and Aspatria Parliaments. They include donations to charitable and social reform societies, also gifts to people in want, and many other purposes.

Co-operation in Italy is somewhat indebted to the Public Good account. Mr. Lawson occasionally visited Naples, and while there, he met with, first, the Signor Pietrantonio, referred to below. Afterwards he made the acquaintance of Professor Burns, and through him he conditionally offered some capital for the furtherance of co-operation in Italy. Professor Burns was a Scotsman, who had lived some years in Italy; he wrote some very interesting letters both to Mr.

* It will be well to explain to the reader that Noble Hall, or "Noble Temple" as it is called, derives its name from the land on which it is situated, that place being known locally as "Noble Fields." The hall is a pleasant, good looking structure, but not ambitious, and "noble" is merely its local proper name, and not an adjective, intended to suggest magnitude, splendour, or vast proportions.

Co-operation in Italy.

Lawson and to Mr. Pitman, the Editor of the *Co-operator*. Writing from Naples May 1, 1871, Professor Burns said—

“I have received the papers from Signor Pietrantonio, consisting of some numbers of the Manchester *Co-operator* and Co-operative tracts. What figure can a Co-operative tyro make among the Manchester Nestors? I had prepared something for the people here, but threw it aside on reading these papers. I am persuaded I cannot do better than translate or concoct, by borrowing largely from what is already published in England, introducing it in an Italian garb to the natives here. I must observe, however, that the field is vastly more favourable with you in England and Scotland, than it is here. The multitude with us have not the slightest idea of Co-operation or its benefits. To use Mr. Disraeli's expression—they must be ‘educated.’ The newspapers (such as they are) do not much trouble themselves about social questions; but one way or another we must get in the small end of the wedge. The other day I was at Barra, a town of about 9000 inhabitants, and visited an old friend—a Bolognese—who has for several years been a co-partner in a large manufactory of matches at Barra, employing over 250 hands, large and small, and of both sexes. We had a long talk about Co-operation. At first he seemed to have forgotten all about it; but on recalling his reminiscences, he entered warmly into the subject. On my remarking that it might be a good thing to establish a society among his people, he appeared not averse to the proposal. We shall see. There is an announcement of a meeting for next Sunday, of the already existing Co-operatives here.”

Miss Lawson translated for the *Co-operator* the following letter of Signor Pietrantonio. The note attached is by the Editor of that Journal:—

“It is certain that the consumer is immensely surcharged who buys goods in the market by retail. This burden is now felt to be increasingly heavy, owing to the unbridled greediness of the monopolists, to such a degree that some kinds of food have been raised to fabulous prices, such as were

An "Economical Co-operative Alimentary Association."

never before known in this country, even in exceptional circumstances. Great complaints are raised on all sides against such illegal trade; and it is easy to see what losses it causes to the less wealthy classes; but nobody has been willing to find means to oppose this torrent which swallows up the greatest part of the means of the people least favoured by fortune; and yet, means there are by which to obviate that which every one deplores. Whoever has any acquaintance with commercial matters, knows that by purchasing goods at first hand for ready money, it is possible to save on some 30, on others 20, or even 15 per cent. Now, the difference between this and their retail price in the market, constitutes the gain of three or four persons, through whose hands they pass. If every purchaser could gain for himself such an advantage, what a saving it would be to him! An economical head of a family, however much he may try to economise, can never attain to the realisation of positive frugality, because he must yield to the necessity of purchasing at second, third, and fourth hand, and not in large quantities; but if 200 or 300 families were to put together each a small sum for a first fund of capital, they would be able to obtain a quantity of goods at first hand, selling them again afterwards among themselves; and they would thus attain the object of turning to their own benefit that which forms the gain of three or four retailers.

"The undersigned then takes upon himself to initiate the constitution of an 'Economical Co-operative Alimentary Association,' on the system of those organised with so much success in England and Scotland, which (formed on the true principle of Co-operation) conceal no secret object of speculation, but tend exclusively to the realisation of frugality and economy.

EMILIO PIETRANTONIO."

"[We have had to curtail this document. It announces that the Co-operative warehouse is to be opened on the 1st July, and gives a list of the goods to be sold, and other business details.]"

Professor Burns wrote in July following a letter to Mr. Pitman, in which he said:—

The Credit System the great difficulty.

"I some time ago received the Co-operative literature which you forwarded me at Mr. Lawson's request. This is a great boon, and will put me *au fait* as to a movement in which several here take an interest, but of which—from my long absence from home—I had hitherto known little or nothing."

"You are aware, perhaps, that Mr. Lawson was here in the Spring, but I think it unlikely that you can have heard of the very handsome proposal he has made to the Neapolitans. After stating certain principles upon which he thinks a Co-operative society might be initiated and conducted in Naples, he offers to lend a sum of 10,000 francs, free of interest, for a period of three years, and this without any advantage to himself whatever. In reference to this place, such offers come 'few and far between;' and without hesitation I may add that on making this generous offer, I think Mr. Lawson must have been actuated more by his own feelings, than by any particular deserts he can have discovered among the Neapolitans, whom I know pretty well, having resided among them for more than a quarter of a century. I believe it is pretty well known that in their customs, habits, and ways of thinking, the Neapolitans differ widely indeed from us, and even from their compatriots in Upper Italy. They are wedded to ancient usages, slow and tardy in adopting (and not unfrequently repugnant to) all kinds of innovation, however beneficial. I think, at the commencement, Co-operation will have—as gas and steam have had—to encounter some opposition, and to surmount obstacles; but I have little doubt that it will ultimately triumph, even in Naples. As yet, however, from many to whom I recommend it, I receive an answer which might almost be stereotyped thus:—'Do you see, I get my things from Pasquale, and often at the end of the month it is not quite convenient to pay ready money, and he gives me credit; so I don't like to leave Pasquale.' For all this, however, the thing seems decidedly to be taking root here. I have in my possession Mr. Lawson's proposal. I have already mentioned it to several persons here.

"We have already in this place one Co-operative society—with two branches—which has been in existence for about

A Co-operative Meeting in Naples.

a year. True, it has not succeeded nor prospered so well as could have been wished; but the cause was by no means the failure of Co-operative principles; but rather from its having been commenced and conducted on too grand a scale for its size, and with too many expensive surroundings. Another I know to be in progress. I have heard speak also of a third; but about it I do not know anything positive.

"I conclude with repeating the words used by Galileo upon another occasion—'*Eppūr si muove.*' On the movement here I shall keep a watchful eye, and do the little I can in its furtherance; and hope that at no distant period you and all well-wishers to Co-operation will learn that the cause in Naples, progresses satisfactorily."

"J. R. BURNS.

"Naples, May 31."

The next letter of the Professor was to Mr. Lawson, in which he said:—

"On the 17th ult. there was a meeting of Pietrantonio's subscribers. Though very unwell at the time, I made a point of attending. The *locale* in Toad Lane, Rochdale, where the Pioneers first met, compared with that where the present meeting assembled, would be a contrast indeed. It was a hall equally majestic, and adjoining that where the other society met, the walls and ceiling adorned with frescoes of saints and angels, and so forth, things of which by this time, I suppose, you are full to satiety. There were thirteen, and one female (a Contessa) present. The circular announcing the meeting said the scope was to discuss the statute and nominate the *employés*. Signor Pietrantonio stated that his subscriptions amounted to only about 2,500 francs in all. This had a damping effect. Every one saw the impossibility of doing anything with it in such a large town as this, although he himself strongly insisted on opening shop, by renting a £30 premises, which, he said, he had in hand—viz., a house and garden. And the money for stock? I proposed at once that the meeting be adjourned,

Insecure Heritable Security.

and that meantime members should use their endeavours—each to procure his one, two, or more additional subscribers, and then to call a general public meeting. More than two hours were spent in desultory talk, the Contessa (and why not?—I am for woman's rights) speaking more than all the rest. The conclusion of all was the adoption of the first part of what I proposed. Nothing more has transpired since.

“Occasionally I pay a visit to the other society's office. One day I found about half-a-dozen there warmly discussing something. As I knew some of them a little, I was welcomed, and sat down. ‘Good news, I hope; may I be permitted to take part in your jubilee?’ ‘Declare war against you? You ought to be ashamed of yourselves to say so. On the contrary, you ought to be proud of it. Is not Naples large enough for twenty societies? and are we not all co-operators? Or is it every man for himself?’ I wish you had been present to see the effect this produced. The laugh that followed betrayed a great deal more than sufficient to persuade me the co-operation they understood differs widely from ours. Since that, I have been once or twice, not as a spy—for espionage in all shapes I detest—but to do them what little good I can by purchasing. Reconnoitering is my object, and a hope to hear they are recovering, which is the case, if what they tell me be true. They say they frequently take 400 francs a-day, but this was in answer to a remark of mine (Holyoake's) that a society, to be successful, ought to take £30 a-week.

“I turn now to a little paragraph in your last, which pleases me. You say—‘If I ever set up shop in Naples.’ That is exactly what I have been hoping for. You have understood me in the sense I wished. At the society's office I was told they were ready with security (heritable) for the 10,000 francs. Were they to offer you the Royal Palace in bond I would say decidedly *No*, because I feel quite certain, however well secured, you would not get your money back without litigation. No city equals Naples in love for law-suits and gambling.

“Naples, June 4.”

“J. R. BURNS.

The Public Good Departments still in use.

This, with the exception referred to in the next chapter, concludes the Public Good expenditure. As indicated in the opening statement, there is still some stock on hand. The Free Library is still in use, and open to all. The Reading Rooms are still free, Sunday lectures are carried on, and many other matters of public usefulness are aided in various ways.

Fruits and Grains Man's proper Food.

CHAPTER IX.

HISTORY OF THE BLENNERHASSET FESTIVALS.

“And there, too, lies Blennerhasset, the Sebastopol of the vegetarians, where the engines, Cain and Abel, groan on their miry way, where a professor is ever composing manures, and where Christmas is kept with apples and biscuits, potatoes and oilcake sauce.”

Mark Lane Express.

FESTIVALS and trips cost £338 9s. 11½d., and as the trips cost about £80, and the festivals were five in number, the latter cost on an average about £50 each.

The first Christmas festival, held in 1866, was the festival of festivals. It was noticed in *Punch*, the *Times*, and most of the daily papers; it also got across the Atlantic, some friend kindly sending us a copy of a Nova Scotian paper, in which about a column was devoted to “A Vegetarian Festival.” The notices of the press amused us very much; and both good and bad were read and criticised; and while much of the adverse criticism was taken home and adopted in future festivals, the credulity of the press, in treating as real, so many improbable statements, afforded us much merriment.

To correct some of their erroneous statements, a few details of the expenses, and the real facts of the failure, may be given. To begin with the food, the great feature of the day: the “raw turnips” were exceedingly few in number, and had been placed on the table for a joke, as no one (except the reporters) were expected to eat them. The strict vegetarian, indeed, eschews what are commonly called vegetables, the fruits and the grains alone being considered as man's proper food. The following detailed statement of the cost of the foods of that day will show how large a place these

The Christmas Bill of Fare.

held in the supply, and how small was the quantity of the vegetables co-called:—

KINDS AND COST OF THE FOODS.—CHRISTMAS, 1866.

| FRUIT AND GRAINS. | | | | VEGETABLES. | |
|-------------------|----|----|----|---------------------|------|
| | | | | s. | d. |
| Apples, . . | £2 | 15 | 4 | | |
| Oatmeal, . . | 1 | 1 | 0 | Celery, . . . | 5 0 |
| Shelled Oats, . | 0 | 17 | 6 | Brussels Sprouts, . | 3 6 |
| Pearl Barley, . | 0 | 9 | 0 | Carrots, . . . | 3 6 |
| Wheat, . . | 0 | 6 | 2 | Potatoes, . . . | 3 0 |
| Peas, . . | 0 | 16 | 10 | Parsnips, . . . | 1 6½ |
| Beans, . . | 0 | 4 | 6 | Turnips, . . . | 1 0 |
| Flax Seed, . | 0 | 1 | 4½ | Onions, . . . | 0 9 |
| <hr/> | | | | <hr/> | |
| £6 11 8½ | | | | 13 3½ | |

The above speaks for itself, and is quite refutation enough without further comment. The real blunders of the day were, first, want of experience; the wheat and the barley, and perhaps the oats, were over-steeped, and had turned sour. Secondly, want of cooking accommodation, such a feast requiring at least four times the cooking accommodation we possessed; and, as a consequence, some dishes were badly singed; and nearly all of them were served up repulsively cold. The wheat and apples, a very nice dish when well cooked, was, that day, simply disgusting; and the only presentable dishes were potatoes and pease pudding. The third cause of failure was over-strictness in the bill of fare. Mr. Lawson wanted to give a truly national meal, in which all the foods should be of British growth. Rice, raisins, currants, and other foreign foods of common use, were in consequence excluded; *sugar*, too, was debarred, a want only surpassed by that of *salt*—salt-less porridge proving quite irredeemable by any amount of apple seasoning. That many of the fruit and grain dishes were palatable to the untrained taste was abundantly proved before-hand, a food committee of four or five neighbours having been invited to taste them; the dinner hour of the week ending 18th Dec. having been devoted to the daily discussion of the relative merits of various simple dishes. Boiled barley and apples,

Failure of the Cooking Arrangements.

wheat ditto, after thirty hours steeping, potatoes boiled and mashed with wheat meal, and vegetable soups thickened with a little flour, were all tried and generally approved of. The item of cost was also taken into account, the intention being to show the possibility of furnishing a good and attractive meal for $\frac{3}{4}$ d. or 1d. per head. Our cooking blunders, however, prevented this intention coming to anything, the greater portion of the food being rendered useless. Indeed, much of it was so singed and soured, that the pigs refused to eat it the second day.

All the guests could not of course make anything like half a meal out of the few usable dishes, and, indeed, but for the distribution of a barrel of brown biscuits and some apples, many would have gone without food entirely. Under the circumstances the people behaved very well, taking the accident good humouredly, and making the best of the situation; but for miles round, the farm and cotters' houses were cleared of bread and everything eatable. The public houses, too, did a good trade; but next year, many anticipating a similar demand, had laid in heavy stocks, and were dissatisfied; for not only were our supplies abundant, but many of the people themselves, having been forewarned in 1866, came well supplied with sufficient for their time of stay.

The programme of this 1866 festival was as follows:—

BLENNERHASSET CHRISTMAS-DAY FESTIVAL.

OF

LECTURING, MUSIC, GYMNASTICS, AND GENERAL SOCIALITY.

All should be present before 10 a.m.

At 10 a.m. precisely, Mr. James Burns, of London, Gymnasiarch, will give his amusing Pictorial and Character-reading Entertainment, showing "How to Read a Man like a Book."

A Fruit, Grain, and Vegetable Meal will be given at Mid-day.

At 2 p.m. Mr. Burns, assisted by a Lady in appropriate costume, will give a Musical, Descriptive, and Gymnastic Entertainment, interspersed with Songs, Speeches, and General Discussion.

At 5 p.m. an Evening Meal will be Given.

At 7 p.m. Mr. Burns will lecture on "The Human Body, and How to Treat It," or the Co-operation of Physiology, with much valuable information about *the proper food for man*.

Programme and Proceedings.

All Musicians are requested to bring their instruments.

The 428 persons who have bespoken *free tickets* are requested to send for them on or before Monday, Dec. 24th, to avoid delay and confusion on Christmas Morn.

Those who have enclosed stamped envelopes may expect to receive their tickets on Dec. 22nd, or Dec. 24th.

Those who have not given in their names may buy tickets at 4d. each.

Those who like, may bring their own spoons.

All should be present before 10 a.m.

The *Carlisle Examiner* described the affair as an "extraordinary festival," and states that in point of numbers it might be termed a great success, there being about a thousand persons present from all parts of the county of Cumberland:—"The place was trimmed up and decorated with evergreens and bannerets, with appropriate mottoes bearing upon Co-operation. Each person, male or female, in the employ of Mr. William Lawson, seemed to have a duty assigned to them to render the arrangements as perfect as possible, such persons being distinguished by wearing rosettes. Parties who had not secured free tickets within the time announced were admitted at fourpence each, which some hundreds paid. Lectures were given on phrenology, gymnastics, and food, during the day, to great audiences, who were much interested in the various subjects brought before them (illustrated as they were by experiments). Singing was introduced, and formed an agreeable feature. Dancing was free and uninterrupted to all who chose to pay a nominal fee to the fiddlers, and heartily enjoyed by hundreds, old and young."

The *Co-operator* had the following report of this unusual entertainment:—

"As somewhat over 400 free tickets had been bespoken, and it being expected that as many more would purchase tickets, preparations were made to entertain about 1000 people, and about that number would be present. Between nine and ten o'clock visitors began to arrive, and from that time till after twelve at noon, there was no peace at the ticket office. About 370 tickets were sold. The first thing that met the eyes of visitors on nearing the village of Blennerhasset, was a large cross, surmounted by a huge cabbage

Musical Gymnastics.

and a sheaf of corn, and having printed in bold characters, "Welcome to the Festival." A conspicuous placard pointed the way to the ticket office.

"Placards were posted in various parts of the extensive building, showing the way to the Dining Hall, Lecture Room, Ticket Office, and Music Hall. At half-past ten o'clock in the morning, Mr. Burns gave a highly interesting phrenological character-reading entertainment, describing minutely, and with great fidelity, the natural characters of a few persons well known to the audience. This part of the day's proceedings was beautifully and instructively illustrated with suitable diagrams. The lecture being over, the dining hall doors were thrown open, and many partook of the fruit, grain, and vegetable food provided in ample abundance for all who chose to eat. I am sorry I cannot justly commend this part of the day's programme, for many of the dishes having been cooked the day before, and the common condiments of pepper and salt being very conspicuous by their absence from all the dishes, a cold, saltless, and pepperless vegetarian meal tended rather to disappoint than to gratify the multitude. At half-past one the two large 14-horse power steam ploughing engines, christened by Mr. Lawson 'Cain' and 'Abel,' whistled and set off, and, followed by a very large number of people, took a journey to the top of the hill behind the farm buildings, thus giving the people a pleasant walk out in the fresh air. At two P.M., Mr. Burns, assisted by a lady, gave a few very interesting and practical lessons on gymnastics, explaining as he went on, the beneficial effects of the various exercises he took for expanding the chest, and strengthening and invigorating the whole body. The gymnastics were all the more interesting as they were done in measured time, to music. As the music hall was open at the same time as the lecture room, many preferred the 'fiddle and the dance' to physiological knowledge, evidently enjoying their own gymnastics as much as the London exercises shown by Mr. Burns. At five P.M., another fruit, grain, and vegetable meal was provided; but as apples were the only fruit—wheat, barley, peas, and beans the principal grain, and turnips, carrots, cabbage, and

Lectures on Food and Disease.

potatoes the principal vegetables—it was not, in the eyes in many, a sumptuous banquet; and as many as had friends of the neighbourhood very gladly availed themselves of their hospitality, preferring the ‘cup that cheers but not inebriates,’ to the kindly fruits of the earth as provided and served up at the festival. At seven in the evening, Mr. Burns gave a lecture on the ‘Proper food for Man,’ in a very humorous, pleasing, and clever manner, showing how people generally eat a great deal that does them no good, and pay more for it than they would for simple and more palatable and nourishing food. He very strikingly showed the cause of disease, and the best way to prevent it. He was listened to with marked attention throughout, and manifested great ability in saying things against the commonly received notions, in a pleasing and convincing manner.

“After the lecture, the Bengal Light was shown from the clock tower, as the signal for dismissal.

“Good order was maintained all day, the farm servants of the establishment acting as officers, and Mr. W. Lawson himself performing the duty of special constable—a fact which was announced by placards posted up on the farm buildings, bearing the words, ‘William Lawson, sworn constable.’

“With the exception of the food department (which can be much improved at the next festival), the entertainment was very satisfactory, pleasing, and instructive, and was much thought of.

M. T.”

The *Carlisle Journal* said that—“On Christmas day Mr. William Lawson, of Blennerhasset, held a festival upon his farm of a most extraordinary character. The programme of the entertainment (to which apparently everybody was welcome to go who chose either to write for a ticket, enclosing a stamped envelope, or to pay fourpence for one on the eventful day) was in itself unique. All musicians who intended to be present were ‘requested to bring their instruments;’ and the announcement ‘those who like may bring their own spoons,’ was appended to the advertisement of the order of the day’s proceedings. Between 400 and 500 people bespoke tickets several days before Christmas; and upon the eventful morning nearly as many more joined them

Newspaper accounts of the Food.

at Blennerhasset. The tickets of admission were curiosities in their way. They were headed 'Christmas Morn, 1866'—and contained the following:—

THE SONG OF THE TICKET.

By ten precisely,
Be in sight;
Show when required,
But keep till night.

Mr. William Lawson's farm is conducted upon co-operative as well as 'high-farming' principles, the plan having been adopted of dividing a tithe among the workers. According to the programme, at ten o'clock precisely, Mr. Jas. Burns, the London gymnasiarch, gave his amusing 'Pictorial and character-reading entertainment, showing how to read a man like a book.' At noon a 'fruit, grain, and vegetable meal' was given. This is described as a most singular effort of culinary art, and not much to the taste of those who partook—or rather tried to partake—of it. There were raw turnips, boiled cabbages, boiled wheat, boiled barley, shelled peas (half-a-ton of each of these three last-named, we believe); oatmeal gruel, with chopped carrots, turnips, and cabbage in it; boiled horse beans, boiled potatoes, salads, made of chopped carrots, turnips, cabbages, parsley, &c., over which was poured linseed boiled to a jelly. As there were no condiments of any kind, either upon the extraordinary messes or the table, and all being cold except the potatoes, it may be imagined that the guests did not sit down with much relish to their vegetarian fare. Each one had an apple and a biscuit presented on rising from the table. In the course of the afternoon, Mr. Lawson's two steam engines called by him 'Cain' and 'Abel,' set off with steam up and whistles screaming to lead a procession over the farm. Three large rooms were used during the day,—the lecture hall capable of holding 1000, the music hall 400, and the dining hall 400."

The Second Christmas Festival was held in 1867, and taking the advice of many of the newspaper critics, beef was provided; but as the food was no part of the business of the

Programme of the Second Festival.

day, a charge was made, though much too little to cover the cost. The programme was to the following effect:—

THE BLENNERHASSET CHRISTMAS DAY FESTIVAL

WILL BE HELD

AT THE BLENNERHASSET FARM ON CHRISTMAS DAY, 1867.

At half-past ten the Balance Sheets for 1866 and 1867 of Mr. William Lawson's Establishment will be read, and all will have full opportunity of discussing them.

Mr. HENRY PITMAN, the Editor of the *Co-operator*, and Brother to the Inventor of Phonography, will be present all day, and will at different intervals address the people on Co-operation, and on the system of shorthand called Phonography, or writing by sound. Mr. Pitman will give specimens of verbatim reporting.

Dr. JONES, of Aspatria, will also be present, and will entertain the people with instructive and amusing addresses, and with music.

Other speakers on various subjects are expected to take part in the proceedings.

There will be vocal and instrumental music. The children of the Blennerhasset Free School will enliven the Entertainment with Songs, in which all may join.

Three Fiddlers have been engaged to supply free music during the day.

Beef, Bread, Soup, Tea, Coffee, and Fruit will be sold in Penny-worths, at about cost price, from 10 a.m. till 5 p.m.

At 7 p.m. splendid Dissolving Views will be shewn by a Magic Lantern from Cox's of London. It will be lighted with the Oxy-Calcium light.

Every person will have full liberty and is respectfully invited to join in the discussions.

N.B.—First-rate Cooks and Waiters have been engaged for the occasion.

This festival created much less stir than the first; but the fame of the latter brought many to the second, who, but for the publicity of the first, would never have heard of our festivals.

All the local journals reported the proceedings. The *Carlisle Journal* said:—"In one large room a platform was erected for the accommodation of the gentlemen who proposed to address the assembly on co-operation and other topics; and running parallel with this apartment, and communicating with it by means of two side doors, was the refreshment room. Across one end of this room, which was capable of holding some hundreds of people, stood a table covered with a rich profusion of beef, bread, and other kinds

Dancing more popular than Listening.

of food ; and about this table a dozen or so of waiters took up their position, in readiness to dispense refreshments to those who required them. A long table made of boards extended down the centre of the room for the use of the feeders. This table was embellished in the centre with a goodly Christmas tree ; and above it, pendant from the roof, hung evergreens, turnips, and other decorations, all disposed so as to give the room as festive an appearance as possible. In order to obtain refreshments it was necessary for the hungry visitor before entering the dining-room to pay his penny or twopence to a man who was stationed in a small apartment in a corner near the door of the lecture hall, something like the money-taker's box at a theatre, and who received the money, for which he issued tickets in exchange through a small semi-circular window. The arrangement had a good effect in preventing confusion in the dining-room. At two o'clock Mr. Henry Pitman appeared in the lecture hall, and discoursed upon Co-operation and Phonography. The lecture concluded, the audience repaired to the music hall, where the three fiddlers who had been engaged to provide gratuitous music for the dancers, had already taken up their position. With the first sound of the fiddle the real fun began. The entrance to the music hall was through an implement shed and up a flight of steps, which, being dark and narrow, and the number of people struggling up them very large, the getting up stairs was attended with infinite squeezing and much boisterous merriment. The room was soon filled to overflowing ; and so dense did the crowd ultimately become, that there was scarcely room for the dancers to turn themselves, so that if their gyrations were wanting in grace, owing to the frequency with which they bumped against each other, they made up for it in hilarity. Mr. Lawson encouraged the dancers with his presence, and did his utmost to keep order, and prevent the crowd of on-lookers from deranging the dancers. Later in the afternoon a large number of persons again repaired to the lecture hall to hear an address from Dr. Jones. The lecture was nipped in the bud by the deepening gloom of evening, and the noise at the other end of the room. The

The Free Food of the later Festivals.

audience gradually diminished, and ultimately the meeting was adjourned until six o'clock. During all this time, the dancing continued with unabated vigour; and those who had left the dancing room to hear the lecture, returned to it to find its inmates as frolicsome as ever. In short, the dancing and the consumption of pennyworths of beef and bread were the only things thoroughly enjoyed; the more intellectual portion of the proceedings, probably because it was contrary to the popular notion of a Christmas-day festival, seemed unappreciated—'twas caviare to the general'—and consequently failed to entertain. An exhibition of dissolving views terminated the day's enjoyments. Upon the whole, the festival at Mechi Farm was highly successful; and, although in some respects rather eccentric, it had the good effect of providing some hundreds of people with an afternoon of innocent and exhilarating enjoyment."

The third Christmas festival was held in 1868, and in it the original plan of a kind of Local Social Science Congress was better carried out. Three lecturers were engaged, who gave, between them, addresses on nine subjects, most of which had reference to social science. Besides these, two local gentlemen also gave addresses on subjects of interest.

Free food, generally in the form of rice, boiled with currants or raisins, was provided in the forenoon, a practice which was carried out in all future festivals; so that, at the second festival only, was payment demanded for all kinds of food. The programme was as follows:—

THE BLENNERHASSET CHRISTMAS DAY FESTIVAL

WILL BE HELD AT THE

BLENNERHASSET FARM ON CHRISTMAS DAY, 1868.

At 9 a.m.—The Balance Sheet for 1868 will be read by Miller Tiffin, and discussion invited thereon.

From 9.30 a.m. till 11 a.m.—Any person may speak on any subject they like, if approved of by the Manager.

At 11 a.m.—Jessie Craigen will speak upon Temperance and Prohibition.

At 12 noon.—Henry Pitman (Editor of the *Co-operator*) will give a short practical address on Phonography (Shorthand), or Writing by Sound, with examples of Verbatim Reporting

At 1 p.m.—John Paton, of Barrhead, Scotland, will lecture on the Poet Burns, with Recitations.

Unexpectedly large demand for Tickets.

At 2 p.m.—Thomas Horn, of Baggrow, will read a paper on French Scenes and Agriculture.

At 3 p.m.—Jessie Craigen will introduce the subject of Woman's Rights.

At 4 p.m.—Henry Pitman will speak on Co-operation—its Powers and Progress.

At 5 p.m.—John Paton will give an address on Social Reform.

At 6 p.m.—G. Glassbrook will address the audience on the Events of the Day.

At 6.30 p.m.—Jessie Craigen will lecture on Capital Punishment.

At 7.30 p.m.—Henry Pitman will give Hints on Health, including Diet, Dress, Breathing, Smoking, &c.

At 8.15 p.m.—John Paton will give a Closing Address.

Discussion will be invited after each address. Volunteer Singers and Instrumentalists will be asked to enliven the proceedings with Music between each lecture.

Three fiddlers will provide free dancing music during the Day, in a Hall set apart for the purpose, where strict order will be maintained.

Soup or Rice-Pudding will be provided Free, between 10.0 a.m. and Mid-day to those who send in their names as mentioned below.*

Bread, Biscuits, Buns, Cheese, Sandwiches, Oranges, &c., Beef and Ham, Lemonade, Ginger Beer, and Soda Water will be Sold in the Refreshment Room, at as near cost price as possible.

* Free Tickets will be given to all who apply, on or before December 18th, 1868, subject to the approval of George Glassbrook, Blennerhassett, by Carlisle. Application by Post must be accompanied by a stamped addressed envelope.

A limited number of Tickets will be sold on the day, at the prohibitory price of 2s.

No admission anywhere without a Ticket.

The applications for free tickets were so immediate and overwhelming, that on Dec. 3rd we had to advertise as follows :—

BLENNERHASSET CHRISTMAS DAY FESTIVAL.

NO MORE TICKETS.

In consequence of the unexpectedly large demand for Tickets (2,664 being bespoke on Dec. 3), and as I think a larger number than that already issued would be unsafe with the limited accommodation at disposal, I regret to announce that I cannot approve of any further issue of Tickets.

I am, yours truly,

Dec. 3rd, 1868.

GEO. GLASSBROOK.

A Crowded Gathering in spite of Rain.

The "prohibitory 2s. a ticket," was meant to prevent overcrowding. Two persons paid this sum that Christmas.

The newspaper reports of this festival were very commendatory. The *Wigton Advertiser* of Jan. 2, 1869, said:—

"Mr. Lawson intended that Blennerhasset should annually be the scene of a local social science gathering, at which all should be allowed to speak and discuss any question they chose, so last year saw a second edition of the first banquet, but, like most 'second editions,' much 'improved' and 'corrected.' Those who 'went to laugh, remained to feed.' Beef, ham, and other usual fare, took the place of the eccentricities of the first festival, so that this year people seemed to have made up their minds that it would be quite possible to spend the whole Christmas Day at Mechi, or Blennerhasset—we are not sure which name Mr. Lawson prefers to give the large estate he is farming on such new principles.

"The programme of Friday last was comprehensive enough to fill the whole twelve hours allotted to it; but there was one thing not 'given in bills,'—the rain—which came down in heavy showers the whole day, and much spoiled the enjoyment of all present, though it had not so much effect on the attendance as might have been expected; as there would not be less than two thousand people present, out of 2700 who applied for tickets.

"There was, however, something else than the rain. There was a lecture-room of proportions vast enough to hold 800 people; and this was so crowded at various times during the day, that even standing room could not be had.

"In the refreshment room there were to be seen plenty of beef and ham (14 rounds of beef and 8 hams), with about 300 loaves of bread, and tea and cakes. Oranges and apples for dessert; and above a ton weight of lemonade, with soda-water and ginger-beer as a variety. From 10 to 12, all who chose might have excellent soup and rice pudding supplied gratis; and some idea may be formed of the quantity prepared, when we mention, that 16 stones of rice was made into puddings. In other two very large rooms music was provided, five fiddlers being present.

Good Management of the Third Festival.

"During the day, 'Cain' took a stroll—a sort of 'constitutional' before dinner—up to the top of the hill behind the farm, followed by a great number of people. In various parts of the different rooms—which were all lighted with gas—were put up mottoes and banners, such as 'Speed the Plough,' 'A Happy Christmas,' 'Striving to make others happy is the real secret of being happy,' 'Don't be selfish, let others have their turn,' 'It is only by courtesy and mutual giving place to each other, that all can enjoy themselves,' 'Self-denial is a real pleasure.' In the refreshment rooms were placards giving the prices of the various articles supplied, so that there could be no mistake. In fact, all the arrangements were well made, and well carried out by those who had the direction of affairs. Mr. Glassbrook was, we understand, manager-in-chief. The proceedings concluded at about 9 o'clock, and everything passed off very well, there being no scarcity of anything, except sunshine. The quality of everything was as good as could be; and the charges were less than moderate; they could scarcely pay."

The fourth and last of the *Christmas* festivals was held in 1869. The previous year's eleven addresses, we had found to be too many, both for the people and the speakers. This year, only two speakers were engaged, each to give two addresses; and besides, three local speakers gave each one address, making seven in all.

The old ticket system was again advertised, more from habit than intention, as we had learnt that it was of no value in forewarning us as to the probable number of stomachs we should have to feed; but at the last moment, Mr. Lawson, who had just returned from America, abolished all the elaborate safeguards of ticket regulations. The programme was as below:—

THE FOURTH BLENNERHASSET CHRISTMAS DAY FESTIVAL

WILL BE HELD

AT THE BLENNERHASSET FARM, ON CHRISTMAS DAY, 1869.

INTENDED PROGRAMME.

9 a.m.—A Christmas Hymn upon the Harmonium and Violin by George Snaith, of Wigton, and Thomas Wilson, of Aspatria, who will also play Select Tunes between the different Addresses.

The Last Christmas Festival.

9.15 a.m.—The Balance Sheet for 1869 will be read by Miller Tiffin, and discussion invited thereon.

Music—"Hard Times come again no more."

10.30 a.m.—E. T. Craig, of Oxford, will lecture upon Practical Education and Training.

N.B.—Discussion is invited after this and all the other addresses.

Music—"Marseillaise Hymn."

12 noon.—C. D. Hunter, of Blennerhasset, will lecture on the Chemistry of Food, with numerous chemical experiments in illustration of the subject.

Music—"Auld Langsyne."

1.15 p.m.—Professor Kirk, of Edinburgh, will lecture on "Our Country's Trade."

Music—"Blue Bells of Scotland."

2.45 p.m.—E. T. Craig will give a lecture on Phrenology, illustrated by character readings of some of the audience.

Music—"Oh Willie, we have missed you."

4.15 p.m.—William Lawson, of Blennerhasset, will give a lecture on "The American People."

Music—"Yankee Doodle."

5.30 p.m.—Professor Kirk will give a lecture upon "The Nation's Highest Good."

Music—"Rule Britannia."

7 p.m.—E. T. Craig will give a lecture on "Ventilation," with illustrations by Model Houses, &c.

Music—"Tramp, Tramp."

8.15 p.m.—George Glassbrook, of Blennerhasset, will speak upon "Co-operation."

Music—National Anthem.

Any alteration in the above programme will be made as public as possible.

Free Dancing Music will be provided in the Dancing Hall, where strict order will be maintained.

Volunteer Singers and Instrumentalists will be asked to vary the proceedings.

Between the hours of 10 a.m. and mid-day some Free Food will be provided.

Bread, Biscuits, Buns, Cakes, Cheese, Sandwiches, Oranges, Apples, Beef, Ham, Lemonade, &c., will be sold in the Refreshment Room at nearly cost price.

No Tickets Required.

Admission free to all above 14 years of age.

“Cain” serves as a Tea-kettle.

This festival was well thought of, as is shown by the remarks of the *Carlisle Journal* of Dec. 31, 1869. In an article it was stated that “the fourth annual festival at Mr. William Lawson’s ‘Mechi Farm,’ Blennerhasset, in this county, was celebrated on Christmas Day with great success. These Christmas gatherings, which at first attracted by reason of their novelty and the somewhat incongruous nature of the feast, seem now to have gained great popularity both in Blennerhasset, its neighbourhood, and for a considerable number of miles around; and on Saturday large numbers of people flocked to the scene of the festivities from all directions, on foot, in conveyances, and by train.

“The whole premises of the spacious farm house had been prepared for the holiday. All the rooms in which any persons would be engaged either in hearing, eating, or otherwise enjoying themselves, were profusely decorated with all sorts of evergreens, mottoes, and injunctions. Some of the inscriptions were not without their amusing phases. For example, the line ‘Self-denial is a real pleasure,’ was placed in proximity to the notice, ‘No Smoking allowed under pain of Expulsion.’ The study of the two mottoes was suggestive of different thoughts according to the order in which they were read. If, after contemplating the pleasures of self-denial in the abstract, the visitor turned to the prohibitory order, he could not but see that a virtue was made of necessity, and the first motto seemed superfluous in view of the stern second. On the other hand, if he took the prohibitory mandate first, and was disposed to grumble at the denial of ‘the weed,’ it was very gratifying to turn to the other motto and see that his self-denial had its own reward. One of the engines used for steam cultivation was utilised in a rather novel manner. Standing, gorgeously decorated, at one end of the eating-room, ‘Cain’ was set steaming, and a pipe having previously been attached to another in the boiler and carried through the wall into the room, the end was placed in a large tin vessel filled with water. Through this pipe the steam from the boiler was impelled at a very high pressure, and was sufficiently hot to boil 60 quarts of water in three minutes. Though this work might seem rather

Mr. Lawson's American Travels.

beneath the dignity of majestic 'Cain,' yet it proved very useful, as it obviated the great inconvenience resulting from the necessity of bearing hot water from the farm-house, as was done last year in very bad weather.

"Lectures were delivered by Mr. C. D. Hunter, of Blennerhasset, on the 'Chemistry of Food;' by Mr. Craig, on 'Phrenology;' and by Professor Kirk, on 'The Nation's Highest Good.' At a quarter to six Mr. William Lawson, the generous and thoughtful provider of the festivities, delivered a lecture on 'The American People.' Mr. Lawson has for a year and a quarter been travelling in America; and he now gave a few of his experiences during his peregrinations. From the lecture, it appeared that the speaker had made an extensive and interesting tour, and had evidently been a thoughtful and observant traveller. He described the wholesale slaughtering of animals for the meat market that is carried on at Chicago; and while touching on Illinois, he described the dress, weapons, and some of the customs of war prevalent both among the aboriginal Indians and their enemies the whites. At Havana (Cuba) he patronised a cock-fight and a bull-fight, and of his experiences there, he gave his audience the benefit. In Louisiana the agricultural operations were the most interesting subject; and he compared the results of steam with manual cultivation to the great derogation of the latter. He gave a comprehensive sketch of the mode of government while describing Washington, and the method of elections. In Maryland Mr. Lawson attended a Fenian meeting, at which the usual Fenian sentiments were expressed. In the mountains of Pittsburgh, bituminous coal is found, but the collieries, instead of being sunk as are ours, are formed by boring straight into the breast of the mountain. In New England, the speaker said, the only genuine Yankees are to be found, and they were the very best people he had ever met with. The lectures given were very well attended, the room being much crowded when Mr. Lawson delivered his."

The *Carlisle Patriot* published an account of the proceedings in the Cumberland dialect, under the title of—

A Report in the Cumberland Dialect.

“T’ BLINRAISET CURSMAS MERRY MACKIN.

“DEAR MISTER EDDITER.—What ah’s warn’t ya’ll hev hard tell o’ them great doos ’at they hev at Blinraiset ivvery Cursmas Day. Ah wad say they’ve been read aboot oa’t warld ower, becose t’ furst ’un they hed was a gay rum ’un if ye mine on. It was what they coat a *vergintarian* feed—they hed nowt to eat but boilt wheat, an’ masht barley, an’ turmets, an’ pez, an’ beans, an’ nettles, ah dare say, teeà, oa mixt up tagidder an’ meàd until a hodge-podge; an’ ah can assuir ya, Mister Edditer, it was a parlish queer mess. Sum fwoak can eat owt ameeast; oor Jack, ’at’s been away i’ forran parts, tells me ’at they git nowt bit paddick-soup i’ sum o’ them cuntries; but ah’s suir oor swine waddent ha’ eaten t’ mess ’at they had at Blinraiset that iurst ’ear, let aleea fwoak.

“It’s a lang rwoad fra Coadbeck to Blinraiset, bit as lal Rachel Dobson an’ me war bent on a spree this Cursmas, an’ as it turnt oot a gay fine mwornin’, we thowt we cuddent deea better nor gang an’ see what mak a carryins on theer was this time. Seea, as suin as ah’d gitten milkt, an’ Rachel hed gitten sidet up, we tuik t’ rwoad. When we gat ta Ireby we owertuik lots o’ fwoak oa gan t’ seeam earant as us; bit Rachel an’ me kept on aheent by oorsels, as we diddent want nea company.

“We gat ta t’ far en’ suin efter nine o’clock, an’ fan heeps o’ fwoak theer ooruddy; an’ efter we teean luik roon us, we went an’ sat doon iv a greet loft ’at they co’t ‘T’ Lectur’ Room.’ An’ it was ebben on Rachel, as she was nobbut rayder tiretish. Seea we sat on an’ lissent a fella readin’ oa aboot hoo they’d been deea in on t’ pleease t’ last ’ear back—hoo they’d manisht t’ farm, and hoo ther gardin stuff hed pait—an’ oa aboot t’ *manner*-an-beeàn machin, an’ t’ girt steam plews. T’ fella meead it oot ’at they were worth abeun fifty thoosan pun, an’ ’at they’d nobbut meead oot o’ that in a heeal ’ear aboot elebben hundred pun odds. Up in oor naberheed, mister edditer, we’re nut seek gowks as ta gang blabbin aboot we mak or what we loss; ’coase if we meead mickle it wad nobbut set somebody luikin efter oor farm, an’ mappen git us oor rent up; an’ if we lost owt we

“What we cud eat, an’ what we cuddent.”

wad nobbut hev harder wark to git sheep or owt a-trust, an’ sheep we cannot dea widoot. Hawivver, t’ Bleniraisset squire suits hissel aboot it. But he wasn’t at oa settisfiet wid t’ profit last ’ear, an’ he telt t’ heed man an’ them seea; an’ what it finisht up wid a fratch.

“By that time Rachel an’ me war gitten verra how, an thowt we wad be better o’ summat ta eat; seea we went away till anudder girt loft and hed a dish o’ tea apiece. We diddent exactly relish t’ waiters they hed aboot t’ please, an’ thowt we cud turn out a varst dooser an’ cannier sample ov oald wives at yan ov oor Coadbeck merry neets; but nivver mind that, t’ tea was verra gud an’ verra cheap, an’ oatagidder ah thowt they war mennin i’ ther crukery.

“We tuik a peep until t’ dancin room as we com oot but theer was nobbut tweea fiddlers yit teunin ther fiddles, an’ they heddent begun ta dance.

“It was gitten on noo till neun; an’ when we come intil t’ foald t’ horses, an’ gigs, an’ carriges, an’ bus leeads, war cummin’ rattlin in ov oa sides ivvery whupwhile. Theer was fwook fra Kessick, an’ Cockermuth, an’ Marypwoart, an’ Wigton, an’ oot o’ t’ Hown; an’ ah think theer wad be neabody left at heeam at Speeatry. Mappen, mister Edditer, ya war theer yersel, if yau hed nobbut kent ya, for they sed ’at theer was a girt lot fra Carel. Ah hard yah fella ’at pretendit ta ken, rackenin up ’at theer waddent be less nor three thoosan oatagidder. Amang t’ rest theer was tweea or three chaps stavelin aboot ’liverin oot tracts; an’ just as ah was thinkin ’at they wad ha’ been as weel at heeam, yan o’ them poppt yan inta my han,’ summut aboot “Dick the miner.” Ah shovt it inta my pocket, an’ thowt ah wad giv’t ta yan o’ t’ Roughtengill chaps.

“Theer was tweea or three mair chaps lecturt in’t girt loft. Yan o’ them, they telt ma, reavelt away a lang time aboot what we sud eat an’ what we suddent; an’ ah thowt ’at we oa kent that gay weel, ’an at he wad ha deun mair gud if he’d just telt fwoak hoo ta git mair o’ what they oa ken’s good for them. Than theer was anudder girt preaching fella oa t’ way fra Eddinburra, ah believe; but theer was sech scrudgin ta git up, an’ far harder wark ta git doon, ’at Rachel

“Lang Life ta t’ Squire.”

an’ me thowt we’d better nut venter. Seea we waitit aboot. An’ efter a bit theer was a queer lal, oald, prossy body, wid a yalla waiscwoat on, an’ specticles stuck on t’ en’ ov his nwoase, moontit sum stairs ootside, an’ gev us a lecter on what he coat Frenolijy, whativver that is; an’ finisht by telling tweea or three chaps ther carrieters by greeapin ther heeds. He telt yan o’ them a gay queer thing or two, ‘at he wad mebbly rader neeabody hed kent bit hissels. He turn’t oot a gay clivver oald chap, an’ as ah hed a bit nwoashun o’ tackin Rachel ‘for better for war,’ ah wantit hur ta gang up and be greapt. But she diddent like ta hev’t deun afore oa them fwoalk.

“We thowt we mud gang an’ hear t’ squire tell what he’d seen on his travels i’ forran parts; seea wid a heap o’ thrustin an’ squeezin we manisht ta git inta t’ loft yance mair. He spak away varra nicely, an’ telt some parlish queer teals. He rayder oppent oor eyes when he telt us t’ size of America, an’ how cheap lan’ was; he sed a man cud hev a farm of a hundred an’ sixty yaccers for just t’ expense o’ t’ title deeds. Ah dunct Rachel than, an’ ah sez till hur, sez ah, ‘We cud manish ta deea famishly there, eh Rachel?’ Rachel nobbat smarkt an’ laught. He telt us about t’ oil wells forbye, an’ showt us twee fellows rigt oot i’ t’ driss o’ t’ fwoak ‘at leevt theer afoor ivver t’ country was fun; an’ than he telt us hoo he went till a cockfeyt an’ a bullfeyt last New ‘ear Day. An at last ov oa he telt us ‘at t’ Yankees, as he coat them, was t’ best fwoak ‘at he’d ivver clap’t eyes on, an’ he’d met a gay few. Sez ah to mesel, ‘Dang tha, my lad, but thoo’s nivver been at Coadbeck than!’

“It was noo gitten leat, an’ a thowt we wad just peep inta t’ dancin-room as we war settin’ off heam; an’ when we gat ta t’ dooar ah propwoset ta Rachel ‘at we wad just finish up wid a dogtrail, seea we did; an’ ah can tell ya, Mister Edditer, ‘at Coadbeck’s bad ta bang at that mack o’ thing.

“It wad full yer newspaper, sur, ta tell ya oa ‘at we saw and did, seea ah’ll just conclude wid wishin’ yea a Happy new ‘Ear, an’ lang life ta t’ squire; may he mak tweea eleben hundreds next ‘ear, an’ may me an’ Rachel be theer next

The Carelessness of Smokers.

Cursmas, and ya teea, Mister Edditer.—Yer obedient sarvent,
 “TIM TARBUCKET.

“Coadbeck, December 27, 1869.”

On the day of this festival we had much anxiety about fire, the danger of which was great; smokers and straw coming so frequently together. The carelessness of smokers is proverbial; but the more hands we set to watch them, the more numerous were the tales of their thoughtlessness. To reduce this danger as much as possible, a smoking-room, well warmed by a large, cheerful fire, was provided; but *still they would* lounge about the stacks and recline among the loose straw in the byres.

Another source of anxiety was the overcrowding of our granaries. For, though these were large, and always well prepared for the occasion, yet our festivals were becoming yearly more popular, and the rooms so crowded, that even a false alarm of fire would have inevitably caused some serious accident.

These, and other points, were discussed in our weekly parliament; and at last it was decided to hold the next festival in summer. It was also decided to hold it in a field, at some distance from the buildings. To insure a good attendance, special cheap trains were engaged, at some risk of loss to ourselves should the day prove wet. The day, however, did not prove wet; and we made a profit on the fares of £7 19s. 3d., which helped, so far, to make this festival the least expensive of the five, its cost being only £33 6s. 7½d.

For this Fifth, or July Festival, three speakers were engaged, two of them speaking twice, and one only once, making five addresses in all. The programme gave these as follows:—

10.30 a.m.—D. P. Foxwell, of London, will Lecture on “What do we mean by Education?”

12 Noon.—R. B. Gibbs, Hon. Sec. of the Anti-Compulsory Vaccination League, London, will Lecture on “Legislation with regard to Vaccination and Medical Practices generally.”

1.30 p.m.—Richard Horne, of the British Temperance League, will Lecture on “The Cause of Drunkenness; its evils and remedy.”

The July Festival held in Marquees.

- 3.30 p.m.—D. P. Foxwell will Lecture on “Our Social System : As it is, and as it should be.”
- 4.30 p.m.—A Walk over the Farm.
- 6 p.m.—Richard Horne will Lecture on “What I think about the strong drink traffic.”

The *Carlisle Journal* said:—“More beautiful weather for such an occasion could not be desired. A fine breeze tempered the heat of a brilliant sun, and made it not only bearable, but pleasant. The scene of the festivities was a newly-mown meadow, on the west of the farm-house, bordering the river Ellen, and it was very well adapted to the purpose, a slack on each side of an airy hill being within its boundaries. Two first-rate and very spacious marquees were erected, one on the east side, nearest the farm-house, devoted to the use of the lecturers and their audiences, and the other on the top of the favourite hill—loved for the breeze blowing over it—set apart for the use of people hungering and thirsting after bodily sustenance and comfort. From ten o'clock in the morning to noon, ‘free food’ was given to all who chose to ask for it. The great steam engine ‘Cain’ was again employed in the ignoble occupation of boiling water for the tea. Mr. Lawson himself took a walk over the farm premises and the meadow, and distributed tickets for a private dinner at the farm, about a hundred guests being invited. The dinner was provided by Mrs. Glassbrook, and was beautifully spread, the tables being also prettily decorated with flowers.”

At this festival, the *Journal* said, speaking generally, “There was a very large attendance of people, all dressed in their ‘store clothes,’ and the ladies generally turning out very gay in their light summer apparel. Cheap trains ran from Maryport and Carlisle to bring guests ; and lectures, repasts, and amusements were alike satisfactory.

“The festival was a decided success. The period of the year was well chosen, and the whole affair taking place in the open air, proved a great advantage.”

It has been mentioned that these festivals cost, on an average, £50 each. The following detailed statement of the third festival, held on Christmas day, 1868, is a fair

Expenses of a Christmas Festival.

sample of the others. It shows a cost of nearly £68, which was, however, exceeded by that of 1869, the average being lowered by the lighter expenses of the first festival, held in 1866, and of the last, held in July, 1870:—

EXPENSES OF THE CHRISTMAS FESTIVAL, 1868.

| | | | |
|--|------|----|----------|
| Lecturers, | £12 | 0 | 0 |
| Music, | 3 | 5 | 0 |
| Crockery, loan and breakages of, | 1 | 7 | 11 |
| Food and drink— | | | |
| Groceries, | £6 | 1 | 8 |
| Bread, | 10 | 17 | 1 |
| Beef and hams, | 22 | 2 | 4 |
| Lemonade, | 36 | 6 | 8 |
| Minor articles, | 4 | 9 | 4 |
| | | | 79 17 1 |
| Propping, arranging, &c.— | | | |
| Joiner work, | 8 | 19 | 10 |
| Wood, &c., | 1 | 13 | 2 |
| Mason work, | 2 | 13 | 8 |
| Railing, | 0 | 5 | 0 |
| Heating, | 1 | 0 | 7 |
| Gas, | 0 | 8 | 2 |
| | | | 15 0 5 |
| Printing and advertising— | | | |
| Tickets, | 1 | 11 | 8 |
| Mottoes, &c., | 1 | 7 | 0 |
| Bills and Posting, | 2 | 19 | 3 |
| Advertising, &c., | 1 | 7 | 6 |
| | | | 7 5 5 |
| Labour— | | | |
| Farm people, | 5 | 19 | 2½ |
| General Account, | 3 | 0 | 2 |
| Waiters, &c., | 3 | 17 | 5½ |
| Horse Labour, | 1 | 2 | 6 |
| | | | 13 19 3½ |
| Gross Expenditure, | £132 | 15 | 1½ |
| Receipts for Refreshments, &c., | 64 | 15 | 10 |
| Net Cost of Festival, | £67 | 19 | 3½ |

The food realised about 20 per cent. less than it cost us, the intention having been to sell it at cost price; but the difficulty of providing for an uncertain number of people, and the anxiety that the starvation of the first festival should not be repeated, led us always to over-provide, and the

Discontinuance of the Festivals.

consequent depreciated sale of the remainder at a sacrifice was latterly the chief cause of loss.

The labour was also a heavy item, though much less so for the July festival. Each of the "officials" had charge of one department; the manager looking after the cooks, waiters, special constables, and helpers-in-general; the chemist being responsible for the lecture arrangements; the clerk, had the busiest place of all, the ticket office; and generally to our engineer, Edward Tiffin, was entrusted the government of the dancing hall. Neither the "officials" nor the labourers found Christmas much of a holiday, almost all hands, and many extra ones besides, being employed in cooking, carrying dishes from the kitchen to the granary, waiting in the refreshment rooms, guarding the stacks and byres from careless smokers, and preserving good order everywhere.

The propping of the buildings was another great expense, costing £4 14s. 3d. in 1868, and £3 9s. 7d. in 1869. This was chiefly necessary for the dancing room, which was nearly always overcrowded; but our joiner was a cautious man, and had it every year so propped, that the floor beams were nearly free from their wall seats. The lecture room also required careful propping; and the cost of all this was one cause of our discontinuing these festivals.

Tables, seats, platforms, and barriers were also expensive, costing each year about £9.

All these things, but more especially the danger of fire, induced us, as has been seen, to hold the fifth festival in summer, and in a field at some distance from the farm buildings; but by this change the precedent of the Christmas Festival was broken, and the trouble and expense were so great that the weekly parliament pretty unanimously consented to discontinue these annual festivals. Some of the drawbacks were business ones, these festivals often compelling a sale of grain, so that the granaries might be empty.

Trips are coupled with Festivals in the accounts. It was customary for the workers to have an excursion to Keswick every year. Usually from 40 to 50 went, the vehicles being the farm carts, which were previously specially pre-

Annual Keswick Trip of the Workers.

pared, by having planks fixed on them for seats, and occasionally bags of straw put on the planks for cushions.

These excursions generally started at 4 or 5 A.M. sometime in June or July; and after 16 miles of driving, first over bare hills, and then through the finely-wooded roads that border Bassenthwaite lake, they would reach Keswick about 10 A.M. Here the people would scatter—some to the lakes, some up the hills, many to the sights of the town, and a few—a very few—to the public-houses. The home-going generally started about 5 or 6 P.M.; but when a band of music or a fiddler formed part of the company, halts were sometimes made on the road for a dance, and it was frequently mid-night before the party got back to Blennerhasset.

The Paris trip, however, forms the main cost under this head, these Keswick trips costing but little, and many of them having been charged directly against the farm. The Paris trip scheme was first broached in the weekly assembly on July 16, 1867, when a letter was read from Mr. Lawson (who was in Paris at the time), to the effect that he would give £2 to every male, and £2 10s. to every female worker of his who should visit Paris, and that, as he did not intend exceeding £60, early application and a recommendation from the village parliament should be obtained.

The grant was latterly raised to £3 for each male, and £4 10s. for each female; and in all, £70 was spent. The grant was not confined to Mr. Lawson's workers, about half of those going being simply neighbours. In another chapter the reader will see an account of this visit by one, who when there, acted as an adviser and helper to Mr. Lawson in a contemplated French farming enterprise.

CHAPTER X.

FARMING LOSSES.

TENNYSON has said—

“’Tis better to have loved and lost
Than never to have loved at all,”

but no one has said “’Tis better to have farmed and lost than never to have farmed at all,” which is true as regards some men who can afford that excellent experience; it being one of the advantages of the rich, that they are able to test that, which, because of its uncertainty and expensiveness, few can try.

On commencing farming in 1862 Mr. Lawson was advised by a farming friend to keep as few books as possible, and he did so; a cash book, kept by the farm bailiff, being the only recognised account book of the business till 1866. Meantime, steam plough balance sheets were wanted, and statements of capital for his co-operative offers. These were made by the aid of sundry irregular books, and a sort of guess-work system of valuation very unreliable; and it was no uncommon experience, to have three or four balance sheets for the same period, but each showing profits differing very widely.

In 1867 a Carlisle accountant was engaged to overhaul and arrange the accounts, previous to our beginning a correct system of book-keeping. Consequently, 1867 was the first year in which we were able to produce a correct balance sheet; and nearly all those now given for previous years, have been made mainly since 1871. To effect this, a close examination of the old books and accounts has been made, the old cash book and many of the old receipts have been overhauled and dissected, and the details entered under their respective departments.

Profit and Loss Statement of all the Departments.

ANNUAL PROFITS AND LOSSES OF EACH DEPARTMENT, AND OF THE WHOLE ESTABLISHMENT,
FROM 1862 TO THE END (1871-3).

| | 1862-4. | 1865. | 1866. | 1867. | 1868. | 1869. | 1870. | 1871. | 1872. | Total. |
|--------------------------|---------|--------|--------|-------|--------|-------|-------|--------|-------|--------|
| 1. Land and Buildings | £ 532 | £ 1748 | £ 3374 | £ 431 | £ 3457 | £ 87 | £ 207 | £ 8699 | £ 288 | £ 6479 |
| 2. Blennerhasset Farm | 2937 | 1919 | 3408 | 438 | 183 | 605 | 1315 | 620 | 337 | 7046 |
| 3. Prior Hall Farm | 3 | 1336 | 836 | 252 | 576 | .. | .. | .. | .. | 1341 |
| 4. Cattle | .. | .. | .. | 1474 | 495 | 36 | .. | 13 | 3 | 2005 |
| 5. Garden | 69 | 91 | 313 | 59 | 47 | 31 | 14 | 18 | 36 | 340 |
| 6. Manure Works | .. | .. | 64 | 147 | 116 | 124 | 167 | 144 | 233 | 235 |
| 7. Steam Plough | 278 | .. | 23 | 343 | 271 | 13 | 67 | 279 | 134 | 850 |
| 8. Flax Mill | .. | .. | 62 | 143 | 43 | 73 | 10 | .. | .. | 331 |
| 9. Starch Mill | .. | .. | .. | .. | .. | .. | .. | .. | 307 | 307 |
| 10. Minor Departments | .. | .. | .. | 29 | 55 | 27 | 21 | 58 | 70 | 218 |
| 11. Newcastle Business | .. | .. | 415 | 15 | 54 | 15 | 112 | 8 | 54 | 545 |
| 12. Carlisle Shop | .. | .. | 17 | 103 | 114 | 33 | .. | .. | .. | 201 |
| 13. Blennerhasset Shop | .. | .. | .. | 20 | 85 | 40 | 2 | 24 | 37 | 44 |
| 14. Ireby Shop | .. | .. | .. | .. | 14 | 53 | .. | .. | .. | 49 |
| 15. Cottage Property | .. | .. | .. | .. | 51 | 117 | 87 | 4 | 33 | 190 |
| 16. American Investments | .. | .. | .. | .. | .. | 16 | 505 | 356 | 293 | 1170 |
| 17. Interest on Money | 17 | 151 | 496 | 744 | 59 | 217 | 11 | 870 | 161 | 2162 |
| 18. Fire in 1871 | .. | .. | .. | .. | .. | .. | .. | 982 | .. | 982 |
| Annual Losses | 2772 | .. | 460 | 2302 | 4616 | .. | .. | 10967 | 1154 | .. |
| Annual Profits | .. | 923 | .. | .. | .. | 1009 | 1716 | .. | .. | .. |

Net Loss in Ten Years, £18,622 19s. 3¼d.

When the Great Losses occurred.

Our aim being a knowledge of the profitableness, not only of each department of the business, but even of each field and kind of crop, of course, much labour was required to keep separate the expenditure and returns of each subdivision. The crop and field balance sheets form the subjects of other chapters; this, and the two immediately subsequent, being devoted to the business departments. The history of each is briefly related, only matters of interest and importance are introduced, the chronology of each being very briefly indicated by an occasional tabular statement. First is given, on the preceding page, a complete profit and loss statement, showing in one, the annual profits or losses of each department and the grand total. The profits are indicated by the mark ("). The odd shillings and pence, omitted to simplify the table, are all given in the separate balance-sheets.

A glance at the last column, which gives the final balance of each department, shows four profitable and thirteen unprofitable departments, the grand total being a loss of £18,622. This equals nearly £2,000 a-year, or almost five per cent. on the average capital. The totals of the table may be relied upon, but the profits and losses of the different years are of course greatly affected by the valuations of each year. Thus, the heavy annual losses shown for 1868 and 1871 belong, properly, to the years before 1867. For, in 1866, when an improved book-keeping made it evident that very heavy losses had resulted, we became alarmed, and remembering all that had been expended on the land in draining, making roads, rooting out old hedges, and dressing heavily with ground bones, the land was valued up some £6,000. Part of this was taken off in 1868, and still more in 1871, when it was desired to publish a moderate valuation in connection with the co-operative offer of that year. The year 1871 was indeed a losing year, for only £8,745 of the loss shown was due to a reduction of the valuations, the remaining £2,000 being actual loss by fire, potato disease, and £870 of interest on the newly made mortgage, which had not yet had time for investment in America.

Taking into account the reduction in the valuations in

Our Land-improving a Losing Business.

1868 and 1871, the years 1868, 1869, and 1870 were comparatively profitable ones. The profit of 1865 is hypothetical, a glance at that column showing the farm an acknowledged loss, the apparent profit coming from land and buildings, and Prior Hall farm, due in both instances to high valuations. But we will now proceed to consider more in detail the history of each department, many of which present features of much interest, and frequently of amusement. The first subdivision is written by Mr. Miller Tiffin, the writer of the steam plough chapter, and who was also architect and clerk of the works during much of the time when the buildings were in progress.

I. LAND AND BUILDINGS.—Old farm buildings at an outside corner of the farm would doubtless suffice, with a nineteen years' lease, for an old-fashioned farmer to earn a competence for the remainder of his days ; but such buildings fell far short of what was required for our extensive and comprehensive schemes.

New buildings and machinery required much outlay, and so did extensive drainage, and pulling down of hedges ; but these things were modern improvements, that ought to be well worth the money spent on them, for if not, what is the use of improving ? We found, however, that when the estate was sold, much loss occurred in our improvement expenditure. Briefly told, the story is this—

| | | | |
|--------------------------------|---------|----|-----|
| Paid for the estates, . . . | £24,120 | 18 | 9 |
| Cost of land improvements, . . | 15,067 | 7 | 11½ |
| | <hr/> | | |
| Total cost, . . . | £39,188 | 6 | 8½ |
| Realisation, . . . | 33,236 | 7 | 3¾ |
| | <hr/> | | |
| Loss, . . . | £5,951 | 19 | 4½ |

Which goes far to show that land improving may be a losing business for landlords ; for admitting that there were superfluous buildings, and mis-expenditures, these things do not account for a loss of nearly £6000.

So early as February 11th, 1862, an agricultural engineer

The Stone-breakers Fined.

came on a professional visit generally, and specially to advise about irrigation in connection with our proposed farm stead-ing. The buildings were erected, and the water-power was adapted, to attain a good system of irrigation. The cattle were to be kept in the house all the year round, the excreta washed into two large tanks, holding 114,000 gallons, from which it was to be pumped at the rate of 140 gallons a minute, on to a few acres near the buildings, so that not two but twenty blades of grass should grow where one grew before. This day saw the building site fixed on. We started briskly. March 8th saw 120 men at work at various jobs on the farm. Draining and uprooting hedges went on apace. By the end of the first five months £138 had been paid for levelling three-and-a-half miles of hedges, and during the first six months £524, in wages alone, for putting in upwards of thirty miles of drains.

As regarded the buildings, the kind of water-wheel was one of the first considerations, as the wheel-pit must have the lowest foundation. After scores of enquiries all over the country respecting the merits and demerits of wheels and turbines, a Fourneyron turbine, by M'Adam, of Belfast, was ordered. The quantity of water in the River Ellen was measured, when it was high and when it was low, and the result was a twenty horse-power wheel, on a fall of about seventeen feet.

Thousands of loads of stones were carted off the farm to the building site. How many can never be known, but it appears from an estimate made by the builder that there were 3468 loads scattered over the farm. The estimate had this significant remark—"Probably below the mark." All this time plans were being prepared, and estimates made; and on August 29th, 1862, the estimate for the new building was £3,500. But stones were wanted, not for buildings only. Thousands of cubic yards of broken stones were wanted for miles of new roads to intersect the farm; and one day in January, 1863, no less than twenty-two stone-breakers were at work, breaking stones by the yard. It must have been about this time that Mr. Lawson, going to inspect the heaps, was followed by a troop of stone-breakers as he went from

Difficulties with the Turbine Water Wheel.

heap to heap, and refused payment on them all, not one being according to contract; and ultimately a fine, according to desert, was levied on each heap. Stone heaps multiplied quickly, and I can remember measuring fifty-two one afternoon, the result of one week's work.

It was a delightful time—destroying the old-fashioned work and preparing the new. Nothing beats destruction for evoking a right good-will. But 1863 comes in upon us, and we must begin construction. The site was levelled, and, starting to build from the lowest point first, the tail-race was excavated, the builders following hard, so as to get the work done before the sides should rush in. Four feet deep at the river, increasing to twenty feet at the wheel-pit, over a distance of 180 yards, was rather a large job. During this year the buildings went on apace, and in November a man came from M'Adam's to fix the turbine, which had arrived some months before. As the turbine was to work under water, even when the water was at its lowest, in the driest summer, the tail-race was sunk one foot below the river level; and as the turbine-pit was two feet lower, it could not but be excessively flooded in November. We were thus in a difficulty, having to fix the wheel on its shaft three feet below the water. It would be wearisome to recount all we did in trying to get rid of the water, so as to get the wheel in place; suffice it to say, that after trying to fix on the wheel above water, and lower the whole apparatus (above a ton weight) down to its seat, it fell a few feet, and bent the shaft, which had then to be sent to Carlisle to be straightened; we at last got it fixed in working order. Meanwhile the head-race was proceeded with. It was made with a beautiful serpentine curve, to bring the surface level with that of the intersected field, so that when the wheel was at rest the water should gently overflow, and without trouble or expense, water the head-race meadow. The race had been constructed so wide and deep, that it could run the water without much waste of fall. When it was in full flow, the water surface was only four inches lower at the wheel-pit than at the river, a distance of 670 yards. A similar difference of level ran the spent water down the tail-race, so

Measurements of the Buildings.

that only eight inches of fall, was thus used to overcome the friction of two channels, 850 yards long; and we thus obtained all the available fall just where it was needed—over the wheel. By and by the machinery, including a straw-cutter, got a peculiar disintegrating root pulper, &c., &c., fixed.

In autumn, 1864, the bailiff removed to the new dwelling-house, and soon after the cattle were taken to the new byre. We were far from being finished yet. The excavation of the liquid manure tanks commenced on December 27th, and was rather a huge job. They stood close to each other, and had a connecting pipe at the bottom. One of them was thirty feet diameter and twelve feet deep, and lined with dressed ashlar; the other was thirty-two and a-half feet in diameter and twelve and a quarter feet deep, and lined with brick and cement. Both were puddled (by professional advice) with moss soil, a plan desirable, perhaps, for its cheapness, but certainly not for its efficiency.

For safety and dignity, such buildings must needs be lighted with gas. On April 19th, 1864, an estimate was made; but it was not till April 1st, 1865, that gas was lit for the first time.

The byre and stable were under one roof, or rather three roofs, the two valley gutters of which were supported by strong oak pillars, along which were the fixings for tying up the cattle, and the long, continuous cast-iron troughs for watering and feeding them.

This building measured 100 feet east and west, by 78 feet north and south. Along the south side, running east and west, were 7 calf pens, $12\frac{1}{4}$ by $11\frac{1}{2}$ feet, then a row of stalls holding 29 cattle, then a double row holding 52 cattle, then the horse stalls and loose boxes in the third row. The breadth taken off for the stables was $20\frac{1}{2}$ feet. The 8 stalls were 6 feet broad inside, with $10\frac{1}{2}$ feet clear behind them. The loose boxes were 16 feet by 13 feet. The 3 rows of cattle therefore occupied $55\frac{1}{2}$ feet of this building's breadth. The roof was high and well-ventilated, and our cattle would have had a luxurious life had we not arranged to keep them on boarded floors without bedding. This was to facilitate the washing of their droppings into a channel

The Barn and the Water Works.

under the boards, which had a descent from each end of the byre to the middle, where the byre was crossed by a large sewer pipe, draining all into the liquid manure tanks, which lay to the north side. The remainder of this block of buildings was thus arranged:—Along the north side of the byre and stable ran a two-storeyed block, 24 feet wide inside. Starting from the east, this building was thus divided:—The engine-house, with its lofty doorway, came first, and was 28 feet long; next the harness room, 8 feet; then the cart shed, with three fine archways, $55\frac{1}{4}$ feet long; and lastly, the granary stairs, 4 feet broad, finished the length. Above the engine-house was the joiner's shop, and over the harness room and cart shed was the granary. At right angles to this, enclosing the end of the byre, and running south, was another two-storeyed block, 24 feet broad, occupying in its length the breadth of the granary, and also the whole of the west side of the byre. The north end of this block was occupied by the barn, $48\frac{1}{4}$ feet long, and the south end by the pulping house, 52 feet long. Over these two was a loft for straw and hay. Here stood the straw-cutter, so placed that the cut straw dropped right down through the floor and into the pulping house, and close to the root pulper. It was customary to mix the cut straw and turnips, and after a few hours' standing, to give them to the cattle. To facilitate this, rails were laid from the pulping house into the byre, and up between the rows of cattle.

Close to the north end of the barn appeared the upright shaft of the turbine, gearing with four horizontal shafts, the longest of which ran through the barn into the pulping house. On the granary was placed, in a suitable corner, a grinding mill, driven—through a hole in the wall—from the long shaft. The same shaft also carried the straw-cutter on the loft above, and the pulper in the pulping house below, and lastly, a churn. To the north-west corner of the north side was built the pump-house, 32 feet by 12 feet, covering the turbine pit and shaft, and containing the large liquid manure pumps and the little fresh-water pump. To the west of this stood the tower, with the fresh-water cistern at the top,

The Manure Tanks and Pumps.

supplied by the little pump. From this cistern the water was conveyed all over the buildings; and at the cattle troughs, by turning only three taps, 81 cattle could be watered in a few minutes. Below the tower, and opening to the north, was a wide passage into the barn for the portable Clayton & Shuttleworth's thrashing machine. Running west from the tower and barn was the spacious Dutch barn, measuring $60\frac{1}{4}$ feet by 59 feet, the two-gabled roof of which was supported by 24 brick pillars, each 20 inches square and about 20 feet high. Between the barn and this building were two large sliding doors, through one of which the sheaves were passed right to the feeding board of the thrashing machine. The other door was close to where the machine deposited the loose straw. It had at first been intended to carry the sheaves to the thrashing machine by machinery, but the first cost would have been too great, so this was never accomplished.

The gas house and smithy—a block measuring $48\frac{1}{4}$ ft. by 28 ft.—stood alone, to the north, and faced the farm road, which passed up the east side of the byre. It ran back parallel to the north side of the granary, and had close behind it the liquid manure tanks. The dwelling-house was placed at a respectable distance from the byre, off the south-west corner. It measured 48 ft. by 37 ft. In addition to this, the out kitchen adjoined its west end, but ran northwards towards the byres. It had the laboratory above.

It was a long time—lasting till well into the summer of 1865—before the three-quarters of a mile of irrigation pipes were laid, the pumps erected, and the liquid manure at work, raining down fertility on the Italian rye grass sown especially for it. When the tanks were finished—a considerable time before the pumps were erected—we bought many carcasses of cattle and old horses—chiefly for their bones. These were killed, skinned, and tumbled into the ashlar built tank. But, as putrefaction went on, the smell was great, and we were threatened by the local sanitary authorities. When the wind was favourable, the dullest nose in Baggrow and Blennerhasset could tell that the pumps were at work, the scent was so strong. We were

Large Granaries and Model Sheep-sheds.

now left to ourselves. Miles of hedges had been uprooted, the farm had been drained, and the gardens laid out. Builders and engineers had gone away. True, it was this year (1865) that Hodgson's estate had come into our possession, and hedge levelling and drain cutting was again somewhat brisk, but the buildings were all up, and the new roads formed or forming, and some of us expected no more new buildings. But one night in June, 1865, Mr. Lawson and the bailiff were seen examining the space to the south of the byres and east of the dwelling-house. Orders were given to have a plan ready by next morning for a building 114 ft. by 53½ ft. Though not so quickly as requested, a plan was drawn, and freely criticised, and then the clock tower building was erected. It ran east and west, having, of course, a mid partition wall supporting the valley gutter between the two roofs, and dividing the building into two breadths, the north division being 22½ ft., and the south division 26 ft. wide. At the east end of this last, rose the clock tower, where was placed a fine turret clock with three faces, each 3 ft. in diameter. The ground plan of the south side was 108 ft. by 26 ft., and had ten pens for sheep on each side, with a gangway up the middle. The pens to the south had also each a door opening outside, by which the sheep could pass into temporary pens out of doors. These were to fatten sheep at a wonderful rate; but the scheme never did well. The ground floor of the north side was thus divided:—first, the office, 19¼ ft. long, with a store room taken off one side; next the implement room, 37 feet long, with its 3 arches. The remainder to the east end was occupied by the coach-house and butchering-house, of nearly equal dimensions. The lofts consisted of two rooms only; one being 108 ft. by 22½ ft., and the other 108 ft. by 26 ft. One of them, on account of the rise of the ground at one end, was but a few feet above ground level, and carts could easily unload into it. It is not too much to say that the energy and perseverance manifested in preparing for model farming would have been equal to carrying it on, had it only been continued. It is remarkable that the irrigating apparatus,

Comments on the Balance-sheet.

costing the amount shown in the balance-sheet below, never had *one* fair trial. In 1870 Benson's estate was added. A repetition of draining and hedge-levelling followed, but only on a small scale. The great interest once manifested in these operations had subsided. Our improvements had become an accomplished fact; and we were now ready to reap the fruits of our enterprise, and, perhaps, we should have done so had not the establishment passed into other hands.

The following balance-sheet calls for some comment, and also some apology. It has been found impossible from the inextricable muddle of the earlier account books, or rather book, to separate the charges to each department. In consequence, the above statement includes many sums that our recent investigations would place to other accounts. This transfer to other departments was made in 1866-67-68, but was done more by guess-work than by knowledge, simply because we could not then tell the real costs. Now that the accounts are got into shape, it would be very difficult to pull down and re-arrange them, and as the totals are correct, and the divisions artificial at the best, it does not matter much under which head some of the items are ranged. Thus the "machinery" of the above debits includes £282 7s. 2½d. really chargeable to flax, starch, and manure departments; the "buildings," £876 16s., chargeable to cottage property; "unexhausted manures," £400, chargeable against the farm in 1871, and altogether a total of £1,577 3s. 7½d., which, in strict book-keeping, would have been charged to other departments. A statement, therefore, taking in only what might be called landlord's capital, shows a loss of only £5951, the other £528, being chargeable chiefly against the farm. Indeed, this balance-sheet must be taken in connection with that of the farm. The farm land averaged about 303 acres during the ten years it was in possession, and it will be seen that our draining cost about £7 10s. per acre all over the farm. About 6¾ miles of old hedges were uprooted, and as, including headriggs, each hedge prevented the proper cultivation of 4 yards on each side, about 19 acres were thus restored to full cultivation.

Expenditure on the Land and Buildings.

LAND AND BUILDINGS BALANCE SHEET,

*Dr.**From 1862 to 1872.*

| | | | |
|--|---------|----|------------------|
| To Amount paid for Dawson's Estate, . . . | £14,000 | 0 | 0 |
| „ „ „ Hodgson's „ . . . | 5,200 | 0 | 0 |
| „ „ „ Benson's „ . . . | 4,050 | 0 | 0 |
| „ Enfranchisement and Conveyance of Benson's Estate, . . . | 870 | 18 | 9 |
| „ Purchase of Benson's Tenant's Lease, &c., . . . | 363 | 14 | 7 |
| „ Draining the Land, . . . | 2,296 | 17 | 7 |
| „ Removing old Hedges, . . . | 347 | 8 | 4 $\frac{3}{4}$ |
| „ Planting new Hedges, . . . | 64 | 14 | 2 |
| „ Making new Roads, . . . | 265 | 18 | 0 $\frac{3}{4}$ |
| „ Purchase and Planting of Trees, &c., . . . | 216 | 15 | 0 |
| „ „ „ Fruit Trees, . . . | 138 | 7 | 4 |
| „ Unexhausted Manures in 1870, . . . | 400 | 0 | 0 |
| „ Sundry Land Improvements, . . . | 113 | 12 | 10 |
| „ Construction of Farm and Cottage Buildings, . . . | 7,637 | 15 | 0 $\frac{3}{4}$ |
| „ Re-construction after the Fire, . . . | 509 | 0 | 9 |
| „ Turret Clock, 1866, . . . | 93 | 2 | 7 |
| „ Farm and other Machinery, . . . | 1,158 | 8 | 3 $\frac{1}{2}$ |
| „ Cost of Irrigation, Purps, Piping, and Hose, . . . | 894 | 19 | 4 $\frac{1}{2}$ |
| „ Cost of Water Supply, . . . | 160 | 15 | 3 $\frac{1}{2}$ |
| „ Hose and Appliances against Fire, . . . | 50 | 18 | 9 $\frac{1}{2}$ |
| „ Grant's Portable Railway, . . . | 47 | 0 | 0 |
| „ Laboratory and Library Furnishings, . . . | 56 | 5 | 10 |
| „ Weighing Machines for Manure Works, . . . | 15 | 18 | 8 $\frac{1}{2}$ |
| „ Iron for Smith Work, . . . | 55 | 1 | 7 $\frac{1}{2}$ |
| „ Wood for Joiner's Shop, . . . | 44 | 6 | 11 $\frac{1}{2}$ |
| „ Furniture for Farm House, . . . | 72 | 19 | 2 $\frac{1}{2}$ |
| „ Lodging-house Furniture, &c., . . . | 19 | 11 | 8 |
| „ School Benches and Ventilators, . . . | 14 | 17 | 2 $\frac{1}{2}$ |
| „ Share of General Account, . . . | 93 | 1 | 1 |
| „ Sundries, . . . | 47 | 5 | 10 $\frac{1}{2}$ |
| „ Expenses and Commission on Sale of the Estate, . . . | 301 | 2 | 4 |
| „ Transfers from other Departments, 1872:— | | | |
| Cottage Property, . . . | £2,900 | 0 | 0 |
| Market Garden, . . . | 2,458 | 10 | 3 |
| Manure Works, . . . | 230 | 0 | 0 |
| Flax Mill, . . . | 145 | 16 | 0 |
| Starch Mill, . . . | 62 | 2 | 9 |
| Gas Metre, . . . | 8 | 0 | 0 |
| Store Room, &c., . . . | 5 | 12 | 0 |
| | —5,810 | 1 | 0 |
| | £45,410 | 18 | 4 $\frac{1}{2}$ |

Receipts and Realisation.

LANDS AND BUILDINGS BALANCE SHEET,

*From 1862 to 1872—(Continued).**Cr.*

By Transfers to other Departments:—

| | | | | | | |
|--|--------|---|---|---------|----|-----------------|
| Cottage Property, . . . | £2,440 | 0 | 0 | | | |
| Garden, . . . | 2,094 | 0 | 0 | | | |
| Manure Works, . . . | 429 | 0 | 0 | | | |
| Flax Works, . . . | 268 | 0 | 0 | | | |
| Wood to Joiner's Shop, . . | 28 | 0 | 0 | | | |
| | | | | £5,259 | 0 | 0 |
| „ Firewood Sold off Hedges, . . . | | | | 14 | 14 | 2 $\frac{3}{4}$ |
| „ Scrap Iron, Lead, and Brass, . . . | | | | 26 | 18 | 4 |
| „ Byre Stalls, . . . | | | | 23 | 5 | 9 |
| „ Machinery at Auction Sale, . . . | | | | 75 | 15 | 9 |
| „ Sand, . . . | | | | 0 | 6 | 0 |
| „ Burnt Wood after the Fire, . . . | | | | 7 | 11 | 5 |
| „ Transferred to other Accounts, . . . | | | | 3 | 8 | 10 |
| „ Rents, . . . | | | | 413 | 3 | 3 $\frac{1}{2}$ |
| „ Damage by Fire, estimated and charged as Loss by Fire, . . . | | | | 606 | 1 | 0 |
| „ Land Sold at different times, . . . | | | | 1,431 | 7 | 6 |
| „ Estate sold for . . . | | | | 30,200 | 0 | 0 |
| „ Machinery by Valuation, . . . | | | | 847 | 0 | 0 |
| „ Goods on hand, . . . | | | | 23 | 5 | 0 |
| | | | | £38,931 | 15 | 7 $\frac{1}{4}$ |
| „ Loss, . . . | | | | 6,479 | 2 | 9 |

£45,410 18 4 $\frac{1}{4}$

Rents, Acreages, and Prices of the Three Estates.

The subjoined statement shows some interesting facts at the time of the estates coming into Mr. Lawson's possession :—

| Date of Entry. | Rent. | Acreage. | Price. |
|----------------------|-------------|-----------|---------------|
| Feb., 1862 ... | £380 ... | 260 ... | £14,000 |
| „ 1865 ... | 113 ... | 73 ... | 5,200 |
| „ 1870 ... | 121½ ... | 87 ... | 4,050 } |
| Enfranchisement, &c. | ... | ... | 861 } |
| | <hr/> £614½ | <hr/> 420 | <hr/> £24,111 |

The rentals thus yielded very little over $2\frac{1}{2}$ per cent., and it is doubtful if a rental could at present be obtained to yield much more. The cottage property would, however, be a help in this direction.

The buildings added over £21 per acre to the cost, taking the average holding during the 10 years, the new roads, about 17s. 6d. per acre, and taking out old hedge-rows, 23s. per acre. The reader is referred to the frontispiece, which shows the hedges as we found them and as we left them, as well as the arrangement of the new roads and new hedges. The irrigation cost about £2 19s. per acre, and the machinery nearly £4.

By far the greater part of these expenditures was incurred before 1867.

| | Total. | After 1866. |
|------------------------|-------------|-------------|
| Buildings expenditure, | £7,637 | £220 |
| Machinery „ | 1,158 | 140 |
| Irrigation „ | 894 | 110 |
| | <hr/> 9,689 | <hr/> 470 |

These three items show about 95 per cent. of the expenditure as occurring in the first four years. It is, therefore, plain, that the profits shown in these years were profits of *valuation*, from which the later years had to suffer. That 1872 gives only a loss of £288, proves also that in 1871 our estimate of the value of the land was very close upon its real value, as shown by its selling price, and that our experience had not been without good result. In selling the

The Question of Rent.

estate, we could not expect to realise anything like full cost for the extensive buildings, the machinery, and the irrigation. The whole estate was purchased for a little under £60 per acre; and, to have sold for what it cost, it should have realised £93 per acre. It realised, in fact, under £80 per acre and perhaps the lesson is this—land worth £60 per acre, cannot be raised to £93 by building, draining, irrigation, and machinery.

M. T.

II. THE BLENNERHASSET FARM balance-sheet might have been included in the foregoing, but its separation will be found a convenience in many ways.

Neither rent nor interest appears in these sheets, Mr. Lawson's idea being at first simply to show, how much could be earned by so much land and so much capital. These charges not appearing, the balance-sheets are not, of course, so useful for commercial comparison. The amount of rent to be charged would, however, not have been easy to decide. You had but to make a remark about our heavy crops, to be told that the farm had always been the best in Cumberland; and nearly every critic thought £2 10s. a fair rent (for a gentleman to pay). But the fact was, that the total rentals of the previous tenants averaged less than £1 10s. per acre. And if we look at the LAND AND BUILDINGS ACCOUNT, and take only the reasonable improvements, £2 per acre, all over, should represent a fair average annual rent, during the last four or five years of our possession. It is, of course, worth more now in 1874, both because of the general rise in rents, and because of some of our latest improvements.

In keeping our farm accounts, it was found that the horse-men were unused to having the provender weighed out to them, and it was therefore impossible, at first, precisely to obtain that outlay. There was also trafficking in horses which makes these figures only approximate. Indeed, in every item of farm expenditure there is no means of determining its precise cost, without a minute and exact system of book-keeping, which no farmer ever undertakes. My experience of the cost of clerkship, and the labour expended in keeping our accounts, with the view of their being useful

Difficulty of keeping Farm Accounts.

to others, leads me to distrust all farm accounts as being anything more than *approximate statements* of profit and loss. Certainly no farmer within my experience, ever took more than half the trouble which Mr. Lawson did to keep his accounts accurately, and in such classification that they should be useful and instructive. The reader, therefore, will take this into account in his examination of the tables placed before him.

The following tables show the chief items of farm expenditure, and farm receipts for each year after 1864.

FARM ANNUAL EXPENDITURE, &c.

| | 1862-4. | 1865. | 1866. | 1867. | 1868. | 1869. | 1870. | 1871. | 1872. |
|--|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| | £ * | £ | £ | £ | £ | £ | £ | £ | £ |
| Wages | 2353 | 1240 | 1519 | 744 | 652 | 564 | 700 | 684 | 92 |
| Implements, &c. . . | 379 | 137 | 172 | 31 | 164 | 112 | 133 | 107 | 25 |
| Steam Cultivation . . | 320 | 383 | 104 | 75 | 243 | 84 | 271 | 159 | 103 |
| Seeds | .. | 54 | .. | 100 | 257 | 257 | 272 | 431 | 78 |
| Roads and Fences . . | 51 | .. | 37 | 36 | 34 | 54 | 24 | 22 | 1 |
| House Expenses, &c. | 347 | 67 | 81 | 60 | 89 | 26 | 61 | 33 | 8 |
| Smith, Joiner, and } Saddler's Work } | 177 | 119 | 158 | 168 | 59 | .. | .. | 7 | .. |
| Horses and Food . . | 232 | 78 | 126 | 101 | 612 | 305 | 428 | 644 | 64 |
| Veterinary | 34 | 37 | 33 | .. | 2 | .. | .. | .. | .. |
| Railway Carriage . . | 2 | .. | 116 | 16 | 18 | 18 | 17 | 8 | 2 |
| General Expenses . . | 132 | 5 | 158 | 151 | 176 | 200 | 192 | 244 | 207 |
| Profit | .. | .. | .. | 438 | .. | 605 | 1315 | .. | .. |

FARM ANNUAL RECEIPTS, &c.

| | 1862-4. | 1865. | 1866. | 1867. | 1868. | 1869. | 1870. | 1871. | 1872. |
|------------------------------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| | £ | £ | £ | £ | £ | £ | £ | £ | £ |
| Sale of Farm Produce | 447 | 378 | 556 | 2090 | 2209 | 2333 | 2797 | 4815 | 2418 |
| Sale of Cattle and } Sundries } | 3137 | 3374 | 4531 | 47 | 14 | 6 | 11 | 27 | 6 |
| Rents of Land . . . | 26 | 24 | 104 | 26 | 24 | 42 | 48 | 28 | 1 |
| Stock on hand in Dec. | 4019 | 3333 | 2271 | 1159 | 2856 | 3339 | 4828 | 3063 | 3 |
| Loss | 2937 | 1919 | 3408 | .. | 183 | .. | .. | 620 | 337 |

* All these sums are given in round amounts. The shillings and pence, however, are always included in the totals, and both are given in the balance-sheet.

Three Years of Profitable Farming.

Wages, horse labour, and others of the above items, form the subject of other chapters, to which the reader is referred. The farm produce sales, it should be explained, mean the annual receipts for grain, hay, potatoes, &c.,—everything produced on the farm, except live stock.

The farm balance-sheet shows a total loss of about £7,000; but it must not be thought that our farming was all loss, for of this £7,000 *nearly all was lost during the first four years*. For if we exclude the reduction of the valuations in 1868, before referred to, the year 1868 showed at the time a balance of £1,241 (wherewith to pay rent, interest, and profit); and 1871 alone of the later years was clearly a loss, owing largely to the potato disease and the compulsory sale of the crops. It must also be remembered that the manure business was really part of the farming business, the separation being merely for convenience. For the farm used much more than half the manures manufactured; and the profits on these must be added before the farm accounts can be fairly compared with those of any large farm purchasing manures or cattle food to an equal amount. At our harvest home in 1871, one of the speakers took this view, and it may be well to give the figures in that form. He took the whole of the profits of the manure business, but it will be fairer here to take just three-fourths. During 1868, 1869, and 1870, the profits of the manure business were £406, three-fourths of which is £304. During the same period the farm profits (taking 1868 at £1,241) were £3,161, or, including the manure, £3,465. This represents an annual profit of £1,155. But let us deduct £2 an acre for rent, or £650 (325 acres being the average farmed during these three years); this leaves £505 profit. The capital, as shown by the stock of both the farm and manure businesses, averaged £4,751; so that the profit on these three years averaged about $10\frac{3}{4}$ per cent. per annum; or, if we first deduct the usual 5 per cent., it stands at $5\frac{3}{4}$ per cent. per annum.

An analysis of all our farm accounts goes to prove that our farming was, in the later years, carried on not only at less expense, but also with more success, as regards the

Blennerhasset Farm Balance Sheet.

| DR. | BLENNERHASSET FARM BALANCE SHEET FROM 1862 TO 1872. | | | | CR. |
|--|---|----|-----|---------|--------|
| To Wages, | £8,974 | 8 | 14 | £18,043 | 3 14 |
| " Implements and Machinery, | 1,260 | 12 | 3 | | |
| " Steam Cultivation, | 1,739 | 19 | 11½ | 9,795 | 19 10½ |
| " Seed, | 1,449 | 6 | 9 | 1,108 | 9 6¼ |
| " Manure and Lime, | 10,183 | 11 | 14 | 135 | 1 8 |
| " Stackyard and Potato Pit Expenses, | 233 | 4 | 6½ | 117 | 4 6½ |
| " Roads and Fences, | 258 | 8 | 11 | 550 | 1 11½ |
| " House Expenses, Coal, and Gas, | 772 | 2 | 3 | 325 | 19 8½ |
| " Travelling Expenses, | 110 | 3 | 5 | 425 | 17 7¼ |
| " Insurance in 1865, | 20 | 13 | 2 | | |
| " Smith, Joiner, and Saddler's Work, | 688 | 14 | 6 | 1,945 | 11 1 |
| " Slates, | 28 | 3 | 6 | 569 | 18 11 |
| " Paint, &c., | 39 | 10 | 11 | | |
| " Horses, and Food, after 1867, | 2,589 | 14 | 4½ | 1,980 | 0 0 |
| " Cattle, Sheep, and Pigs (1862-6), | 9,188 | 16 | 8 | 2,651 | 2 0 |
| " Poultry, | 37 | 0 | 5 | 400 | 0 0 |
| " Game for Newcastle (1866-7), | 64 | 2 | 7 | 6 | 17 6 |
| " Cattle Food, &c. (1862-6), | 5,503 | 13 | 6½ | 54 | 17 9 |
| " Veterinary Expenses, | 105 | 2 | 10½ | 3 | 0 10 |
| " Railway Carriage, | 197 | 7 | 8 | 7,046 | 0 14 |
| " General Account, | 1,505 | 0 | 1 | | |
| " Sundries, | 178 | 18 | 8½ | | |
| " Harvest Homes, Trips, &c., | 30 | 9 | 11½ | | |
| | £45,159 | 6 | 34 | £45,159 | 6 34 |
| By Sales of Farm Produce, | | | | | |
| " Beef, Mutton, Pork, | | | | | |
| " Skins, and Wool, | | | | | |
| " Dairy Produce, | | | | | |
| " Game, | | | | | |
| " Poultry, | | | | | |
| " Sundry articles, | | | | | |
| " Rents of Land, | | | | | |
| " Manual Labour for other Departments, | | | | | |
| " Horses and Labour for other Departments, | | | | | |
| " Manure to other Departments, | | | | | |
| " Stock Transferred— | | | | | |
| To Manure Works in 1865, | | | | | |
| To Cattle, Sheep, and Pigs in 1866, | | | | | |
| Unexhausted Manures in 1870, | | | | | |
| Field Experiments in 1870, | | | | | |
| Sale of Furniture in 1871, | | | | | |
| Stock on hand, | | | | | |
| Balance, being Loss, | | | | | |

Marked increase of the Receipts after 1866.

value and amount of crop grown. This is well shown below, in a comparative statement of the wages, and of the sales of farm produce per acre for each year after 1864. The amount of sales given for each year is not, of course, solely of that year's produce. For instance, in 1868 much of the hay was sold before the end of the year, whilst the corn and root crops were sold chiefly in 1869. But these things balance; and, for comparison, the figures are to the purpose. The purchases of cattle and cattle foods have, of course, been deducted first, and show the years previous to 1866 a blank, the purchases of the first four years exceeding the sales by £1,817.

RECEIPTS FOR FARM PRODUCE, AND EXPENDITURE ON
WAGES, PER ACRE, FOR EACH YEAR.

| Year. | | Sales, per Annum. | | Sales, per Acre. | | Wages, per Acre. |
|-------------------------------|-----|----------------------|-----|---------------------|-----|---------------------|
| 1862-4 | ... | — | ... | £0 0 0 | ... | £3 0 4 |
| 1865 | ... | — | | 0 0 0 | ... | 4 2 8 |
| 1866 | ... | £2,110 | ... | 7 0 9 | ... | 5 1 3½ |
| 1867 | ... | 2,223 | ... | 7 10 1½ | ... | 2 10 4 |
| 1868 | ... | 2,339 | ... | 7 18 0 | ... | 2 4 0½ |
| 1869 | ... | 2,809 | ... | 9 9 9 | ... | 1 18 1 |
| 1870 | ... | 4,842 | ... | 12 13 6 | ... | 1 16 8 |
| 1871 | ... | 2,427 | ... | 6 7 9 | ... | 1 16 0 |
| Average of last six years, | | 2,791 | ... | 8 9 11 | ... | 2 11 1 |

The above refers to the farm only, the 20 acres of garden land being excluded; and from the wages column all the labour expended on buildings, land improvements, and everything else not strictly farming, is also excluded. We see in the sales per acre a steady increase every year, those of 1870 being nearly double the sales of 1866. The potato disease in 1871, as has been said, is the chief cause of the short-coming of that year, more than one-fourth of the farm having been then under potatoes, which realised fully £11 per acre less than those of 1870. The wages column, on the other hand, shows a steady decrease after 1866, which

The Causes of our Earlier Losses.

continued even to the last year, though the acreage under potatoes was greatly increased.

From the steady nature of this improvement, I think Co-operation should be credited with a share in it. I know that after the first taste of bonus money in 1869, there was more faith exhibited in it by the work-people, and in many cases, a real endeavour was made to keep down the expenses and further the business.

This balance sheet for our ten years' farming shows, as has been observed, a total loss of £7,046, increased, of course, very considerably if we add rent and interest. The causes of the great losses in the earlier years we need not go far to seek. Injudicious cattle-feeding, as will be seen when balance sheet IV. is discussed, was to blame for much of it. The excessive labour expenditure of the earlier years, as before observed, accounts for some of the loss, and, no doubt, too, the conversion at first of *all* the cattle manure into liquid, and its consequent waste by drainage through our porous gravels, did a little to make these years unfortunate.

Some items in the balance sheet require a little explanation. "Insurance in 1865" is for the new buildings. It was not continued after 1865, as a very high premium was required on account of the Flax Mill. "General Account" will be found in all the balance sheets. It included a portion of the wages of the bailiff, chemist, and clerks, and the expenditure on postage, stationery, and other matters. At the end of the financial year, it was apportioned off to each department. The credit of £400 for "Unexhausted Manures in 1870," will be found explained in the chapter on "Manures." It was due to an oversight at the time, that it was not debited to 1871, as it should have been.

Before commencing farming, a friend, with some experience of gentleman-farming, had jocularly promised, to show Mr. Lawson how to farm with a loss of only £200 a-year—a sum which would, on Mr. Lawson's farm, at that time, have been at the rate of about £1 per acre. This promised lesson we more than learned, the actual loss proving about £2 per acre per annum.

Prior Hall Farm Balance Sheet.

| DR. | PRIOR HALL FARM BALANCE SHEET, FROM 1865 TO FEB. 1868. | | | | CR. | | |
|--|--|----|-----|--|---------|----|----|
| To Stock on hand, . . . | £6,867 | 1 | 6½ | By Sales of Farm Produce, . . . | £1,203 | 19 | 6¾ |
| " Expenditure on Land and Buildings, . . . | 1,498 | 3 | 1¾ | " " Dairy " . . . | 22 | 13 | 6¾ |
| " Expenditure on Fixed Machinery, . . . | 32 | 3 | 0 | " Sales of Cattle, Sheep, Pigs, and Skins, . . . | 2,546 | 10 | 9½ |
| " Expenditure on Implements, 190 | 6 | 7 | | " Sales of Horses, . . . | 139 | 15 | 0 |
| " Wages, . . . | 1,498 | 1 | 3¾ | " " Poultry, . . . | 8 | 10 | 4½ |
| " Manure and Lime, . . . | 1,136 | 19 | 10½ | " " Manure, . . . | 62 | 5 | 0 |
| " Steam Cultivation, . . . | 47 | 5 | 0 | " " Sundries, . . . | 70 | 18 | 5 |
| " Seeds, . . . | 103 | 16 | 7½ | " Rents, . . . | 64 | 8 | 11 |
| " Horses, . . . | 131 | 0 | 0 | " Sale, Jan. 8, 1868— | | | |
| " Cattle, . . . | 834 | 16 | 0 | Land and Buildings, . . . | 10,849 | 0 | 0 |
| " Sheep, . . . | 446 | 2 | 0 | Machinery, . . . | 44 | 10 | 0 |
| " Cattle Food, . . . | 680 | 1 | 1¼ | Implements to Blen- | | | |
| " Veterinary Expenses, . . . | 12 | 11 | 6 | nerhasset, . . . | 44 | 11 | 10 |
| " Joiner, Smith, and Saddler Work, . . . | 107 | 1 | 11 | | | | |
| " Railway Carriage, . . . | 11 | 7 | 11 | | | | |
| " General Account, . . . | 118 | 13 | 10½ | | | | |
| | £13,715 | 11 | 4¾ | | | | |
| | 1,341 | 12 | 0¾ | | | | |
| " Balance, being Profit, . . . | £15,057 | 3 | 5½ | | | | |
| | | | | | £15,057 | 3 | 5½ |

The Prior Hall Farm Profit.

III. PRIOR HALL FARM stands foremost of our four profitable departments, showing over the three years during which we held it, a profit of £1,341 (not taking into account any charge for rent or interest). We only wish, looking at the long list of losses, that we could fairly claim the above as undoubted profit; but we cannot, for the case stands thus:—The land, &c., was valued when we got it at £6,867, and on this was expended £1,498 in various ways, tending to increase its permanent value. Then, manure to the extent of £1,136 was purchased, and cattle food, £680. Now, for the two last we cannot, at the outside, allow more than one-fourth value, seeing they are spread over three years; indeed, one-eighth would be more than enough. But taking one-fourth, this gives us for unexhausted manures £454 5s. 3d.; and if we add the whole of the expenditure on land and buildings, we get £8,819 9s. 11½d. as the highest valuation warranted by the facts. But the land was valued in 1868 at £10,849; and as it was sold in a lump with three other estates, it seemed the proper course to credit Prior Hall with the latest valuation, which stood, as has been seen, at £2,030 above the more probable valuation. We much fear, therefore, that Prior Hall, though not so bad as Blennerhasset for the same three years, cannot be claimed as a profitable farm.

Its cattle also show the same results as those of Blennerhasset; for if we add together the items cattle, sheep, and cattle-food, we get £1,960 19s. 1½d. And if, for farm produce consumed by the cattle, &c., we take the annual production of the farm at £6 per acre (above £8 being the Blennerhasset average), we get on the 146 acres for the three years £2,628; and deducting from this the £1,203 of farm produce sold, we get £1,425 as the lowest amount chargeable against the cattle. This gives a total on the debtor side of £3,386. Then the creditor side shows £2,569 4s. 4½d. for sales of cattle and dairy produce; and if we value the cattle manure at one-fifth their food, this adds £421—making the total creditor side £2,990, a sum £396 short of the debtor figures.

Excluding the few weeks of 1868, the following shows

Mis-management of the Cattle Business.

how a few of the chief items were spread over the three years of Prior Hall farming:—

PRIOR HALL ACCOUNTS.

| | 1865. | | | 1866. | | | 1867. | | |
|---|--------|----|----|--------|----|-----|--------|----|-----|
| Expended on— | £ | s. | d. | £ | s. | d. | £ | s. | d. |
| Land and Buildings, | 641 | 8 | 7½ | 717 | 9 | 1½ | 139 | 5 | 4¾ |
| Wages, | 331 | 6 | 9¼ | 507 | 8 | 6½ | 582 | 6 | 7½ |
| Manure and Lime, . | 18 | 9 | 3 | 641 | 3 | 11½ | 466 | 10 | 8 |
| Cattle Food, . . . | 337 | 19 | 5¼ | 265 | 4 | 4½ | 74 | 1 | 2½ |
| Cattle, | 803 | 6 | 0 | .. | | | 31 | 10 | 0 |
| Sheep, | 251 | 12 | 0 | .. | | | 194 | 10 | 0 |
| Steam Cultivation, . | .. | | | 45 | 0 | 0 | 2 | 5 | 0 |
| Sales of Farm Produce, | 36 | 8 | 6 | 119 | 12 | 9½ | 509 | 6 | 7¼ |
| „ Dairy „ | 1 | 17 | 0 | 14 | 9 | 4¾ | 6 | 7 | 2 |
| „ Cattle, &c., . . | 404 | 14 | 8 | 679 | 19 | 6½ | 1,237 | 1 | 1 |
| Value of Stock and Land in Dec., | 10,331 | 3 | 9 | 12,717 | 19 | 3½ | 12,436 | 1 | 10¼ |

IV. OUR losses on CATTLE, SHEEP, and PIGS were very great. Charges of dishonesty and robbery were freely made by those who knew least about it; but bad management and divided authority seem to have been chiefly to blame. Mr. Lawson wanted the cattle to be stall-fed, and on open bare boards, practices quite foreign to the training and ideas of the bailiff and the cattle man. This system proved unprofitable with the class of cattle purchased, the plan being suitable only for cattle bred to it. But there were many other faults of management besides these—waste, resulting from new methods badly supervised, and the want of trading experience. On these points Chapter XIII. will be found to throw some light.

The balance sheet proper, which shows a loss of about £2,000, refers, however, only to the latter end of the business; the busiest days of cattle-feeding being over by 1867, when the balance sheet begins; but a pretty fair idea of the earlier years has been rendered possible by the recent examination of the accounts; and the following balance sheet for 1862-6 has been taken from the farm balance sheets for those years. The estimate of the farm produce is taken at £6 per acre; and to get at the quantity consumed by the

Heavy Losses from Cattle Feeding.

cattle, the sales of produce are deducted, and £1500 besides for horse food. On the contra side, one-fifth the price of all the food, purchased and home-grown, is allowed for the value of the manure.

CATTLE BALANCE-SHEET FROM 1862 TO 1866, INCLUSIVE.

| <i>Expenditure.</i> | | | | <i>Receipts.</i> | | | |
|-------------------------------------|---------|----|-----|---------------------|----------|---------|-------|
| Cattle, Sheep & Pigs | £9,188 | 16 | 8 | Sales of Cattle, | } £9,795 | 16 | 6½ |
| Purchased Foods, . | 5,252 | 11 | 11½ | Sheep & Pigs, | | | |
| Farm produce consumed (estimated) } | 4,276 | 0 | 0 | „ Dairy Produce, | | 1,104 | 19 5¾ |
| Labour, . | 259 | 5 | 4½ | Allowed for Manure, | | 1,905 | 14 5 |
| Veterinary, &c., . | 127 | 6 | 2 | Stock, Dec., 1866, | | 2,651 | 2 0 |
| Marketing, . | 55 | 6 | 3½ | | | | |
| | | | | | | £15,457 | 12 5 |
| | | | | Loss, . | | 3,701 | 14 0½ |
| | | | | | | | |
| | £19,159 | 6 | 5½ | | | £19,159 | 6 5½ |

This shows a loss of £3701 14s., which is probably under-estimated; the production of the farm being valued too low at £6 per acre. Taking it at £8 (the average of our experience), the above statement would show a loss of about £6000, most of which would be from the horned stock. For our experience after 1867, when the accounts of each were kept separate, shows the cattle worst; the profit and loss account of each kind of stock being as follows:—

| | CATTLE. | | SHEEP. | | PIGS. | |
|---------|---------|----------|---------|--------|---------|-------|
| | Profit. | Loss. | Profit. | Loss. | Profit. | Loss. |
| 1868 | £0 ... | £494 ... | £12 ... | £0 ... | £0 ... | £13 |
| 1869 | 0 ... | 41 ... | 0 ... | 0 ... | 5 ... | 0 |
| 1870 | 3 ... | 0 ... | 0 ... | 0 ... | 0 ... | 3 |
| 1871 | 3 ... | 0 ... | 0 ... | 0 ... | 0 ... | 0 |
| Balance | 0 ... | 529 ... | 12 ... | 0 ... | 0 ... | 11 |

The above shows the sheep to have been *then*, the only profitable stock, but of the £1474 cattle loss in 1867, much was undoubtedly due to sheep, of which we foolishly bought a large quantity in 1866, at the absurdly high prices then ruling; indeed, it is a matter of fact that some which cost us over £2 per head were sold for 8s. This was, however, on account of disease; but, excluding these, there was still a very heavy loss on the sheep in 1867.

Cattle, Sheep, and Pigs Balance Sheet.

CATTLE, SHEEP, AND PIGS.

| DR. | <i>Balance Sheet from 1866 to 1872.</i> | | CR. |
|---|---|-------|--------------|
| To Stock from the Farm, | | | |
| Dec., 1866, . . . | £2,651 | 2 0 | |
| " Cattle Purchased, . . . | 1,346 | 18 10 | |
| " Sheep Do., . . . | 521 | 0 3 | |
| " Pigs Do., . . . | 56 | 1 0 | |
| " Cattle Food from Farm, &c., 2,917 | 15 9½ | | |
| " Veterinary Expenses, . . . | 23 | 15 5 | |
| " Wages, . . . | 361 | 2 3 | |
| " Travelling Expenses, . . . | 20 | 0 7½ | |
| " Railway Carriage, . . . | 11 | 8 10 | |
| " Advertising, . . . | 24 | 6 4 | |
| " Repairs to Building, . . . | 12 | 4 0 | |
| " General Account, . . . | 127 | 15 2½ | |
| | £8,073 | 10 6½ | |
| By Sales of Cattle, Beef, and Skins, . . . | | | £2,450 11 0½ |
| " Sales of Sheep, Mutton, and Wool, . . . | | | 2,185 17 2½ |
| " Sales of Pigs and Pork, . . . | | | 546 16 8 |
| " Sales of Dairy Produce, . . . | | | 439 7 9 |
| " Sales of Manure to Farm and Garden, . . . | | | 394 18 11 |
| " Pasturage, . . . | | | 50 8 3 |
| " Balance, being Loss, . . . | | | 2,005 10 8½ |
| | | | £8,073 10 6½ |

Farming without Cattle.

This shows a loss of £2005 on a business of £8073, being at the rate of nearly 25 per cent.; and as the previous balance sheet shows that this was pretty general over the whole seven years, and under three different farm bailiffs, it suggests the question, whether, if every farmer weighed every scrap of food and bedding used by his cattle, charging them at current market rates; and weighed also the manure obtained, valuing it too at current market rates; and charged also the labour of cattle tending and trading;—whether, after so separating the cattle-trade from his farming proper, he would not begin to ask, Is there no way of farming without cattle? This question was forced on us, immediately we began to place every department on its own bottom, so to speak; and though latterly, we farmed somewhat successfully without cattle, the time was so short, that all we do claim is, that the nearer we approached to profitable farming, and the more carefully we sifted our facts, the more convinced we became, that on some soils crop-farming would yet prove more profitable than stock-farming. At the present moment, when high wages have greatly increased the price of meat, this view may seem less tenable than ever. But facts must tell in the long run, as the spread of knowledge exposes many popular fallacies about food, and as the science of manuring becomes better understood.

To show the extent to which we pushed this business, a few of the larger items are given on page 173, for each year, as far as they were kept separate in the accounts.

1866 shows itself in every respect the great cattle year; the purchases and sales of cattle, &c., exceeding those of any other year, our Newcastle shop being then the great customer for beef, mutton, and dairy produce. To our two shops in Newcastle there were sent, in 1866, cattle, sheep, and pigs to the value of £804; milk, £376; and butter, £5. Besides this, nearly £200 worth of milk had been sent to a milk-seller there, before the opening of our own shops. The financial results of this were bad at both ends, our Newcastle business showing that year a loss of £415, and the farm a loss of £3408.

Annual Details of the Cattle Business.

| Stock— | 1862-4. | | 1865. | | 1866. | | 1867. | | 1868. | | 1869. | | 1870. | |
|---|---------|-------|-------|--------|-------|-------|-------|-------|-------|-------|------------|-------|--------------|-------|
| | £ | s. d. | £ | s. d. | £ | s. d. | £ | s. d. | £ | s. d. | £ | s. d. | £ | s. d. |
| Cattle . . | 1016 | 0 0 | 937 | 10 0 | 934 | 0 0 | 944 | 10 0 | 740 | 16 0 | } 338 10 0 | | } 129 0 0 | |
| Sheep . . | 1374 | 11 0 | 383 | 17 0 | 1570 | 12 0 | 452 | 5 0 | 404 | 16 0 | | | | |
| Pigs . . | 58 | 5 0 | 56 | 10 0 | 146 | 10 0 | 50 | 15 0 | 65 | 15 0 | | | | |
| Purchases of Ditto, . | 3780 | 4 11 | 1464 | 9 6 | 3944 | 2 3 | 1725 | 8 10 | 126 | 10 3 | } 48 11 0 | | } | |
| * Purchases of Oats, } Cakes, Turnips, } Grass, &c. } | 1755 | 13 4½ | 1030 | 9 6¾ | 2466 | 9 0 | 1683 | 14 7 | 321 | 18 4 | | | } 196 15 10¾ | |
| Sales of Cattle, &c. | 2992 | 0 0¾ | 3033 | 7 8½ | 3770 | 8 9 | 2942 | 10 3½ | 1458 | 6 9 | } 415 11 7 | | } 122 8 0 | |
| Sales of Dairy Produce | 129 | 11 11 | 339 | 15 10¾ | 635 | 11 8 | 260 | 12 3½ | 94 | 8 3 | | | } 29 14 11½ | |

* The “purchases of oats, cakes,” &c., in 1862 to 1866 (inclusive), do not include the consumed produce of the farm.

Facts in Dairy Farming.

Dairy farming was the great feature of 1865, 1866, and 1867; the Newcastle contract beginning in 1865, and our own shops afterwards keeping up the demand into 1867. When, first in 1865, we obtained 11d. per gallon for new milk, delivered there carriage free, we tried some experiments as to the relative profitableness of so selling it, as against keeping it at home for the production of butter.

We found that $22\frac{1}{4}$ gallons of new milk gave 13 quarts of cream, and 19 gallons of skim milk. We also found that 72 quarts of cream produced 43 lbs. of butter. At this time we were sending daily to Newcastle about 50 gallons; for which, after deducting railway carriage, &c., we realised the net price of $9\frac{1}{4}$ d. per gallon, or a daily net return of £1 18s. $6\frac{1}{2}$ d. But taking the above figures, this 50 gallons, if made into butter, &c., would have realised as follows:—

50 gallons of new milk would produce—

| | | | | |
|--|---|----|----|-----------------|
| $42\frac{1}{2}$ gallons of skim milk, at 3d., | . | £0 | 10 | $7\frac{1}{2}$ |
| 17½ lbs. of butter, at 1s. 4d., | . | . | 1 | 3 4 |
| $5\frac{1}{2}$ gallons of butter milk, at 2d., | . | . | 0 | 0 11 |
| <hr/> | | | | |
| | | £1 | 14 | $10\frac{1}{2}$ |

This gave for the home price about $8\frac{1}{4}$ d. ($8\cdot37$) per gallon, or nearly 4s. less per diem than the Newcastle returns—a difference that proved of great weight in inducing us to enter upon the disastrous Newcastle business.

The quantity of milk obtained on an average, from each of our cows we cannot tell. We should have been able to do so, but the milk sheets showing the daily yield of milk were kept much better than the account of the daily number of cows; and we cannot, in consequence, be sure of our facts here. We had a list of the yield in a friend's dairy, and from it the following figures have been taken:—

YIELD OF MILK PER COW.

| | | | |
|----------------------------------|---|-----------|---------|
| Average yield of milk per annum, | . | 1928½ | quarts. |
| Highest | „ | 3831 | „ |
| Lowest | „ | 528 | „ |
| Average | „ | per diem, | 5·19 |
| Highest | „ | 19 | „ |

A Market Garden Begun.

The above shows considerable variation, and the average yield is rather lower than some I have seen published ; but, judging from our balance-sheet, our own yield was probably lower still.

V. THE GARDEN is almost as deserving of a separate chapter as the steam-plough, as it was nearly as unique in its way. The gardener, who became farm bailiff in 1867, was asked to write an account of it, but declined. A neighbouring farmer and critic then took it in hand, but the mass of figures and facts proved too much for his time, and probably, too, for his patience; and he could not finish it. Much, however, of what follows is by this friend.

In the interval between deciding to farm the Blennerhasset farm and entering upon it, Mr. Lawson visited many of the great market gardens, and private gardens as well, in both England and Scotland. Among others, he visited some experimental gardens at Edinburgh, the nursery gardens of Peter Lawson & Son, some gardens in the Carse of Gowrie, and many in different parts of England, including those at Holker Hall, "where they grow excellent grapes, and plant potatoes in November."

In February, 1864, the garden was first laid out, and soon afterwards, a small plantation and hedge were planted around it. By November, 1000 gooseberry bushes and many hundreds of fruit trees had been planted, Mr. Lawson engaging his father's head gardener to plant every one with his own hands. Things evidently looked well at this time, for in December, when his father's steward valued the estate, the 16 acres of garden land were estimated at £150 per acre.

Meantime marketing was begun, but proved rather an expensive mode of sale ; the cost of man, and horse, and tolls, often amounting to nearly one-fourth of the sales. But sometimes it was worse; for in June, 1865, a man was sent to Silloth, a watering place ten miles to the north, where good prices were obtained for vegetables and fruit; but night came and he did not appear. Next day a second man was sent to find him, and though he was successful, the cause of

The Garden Cropping and Produce.

the delay, and the cheapness of the sales were never clearly explained.

Strawberries and rhubarb proved the most paying crops; for the farm generally grew better potatoes and cabbages than the garden did. Why, it is difficult to say—the chemist claiming that his chemical manure, which the farm used largely and the garden but little, was the cause of superiority, and others attributing it to soil and rotation.

Subjoined is a list, rejecting fractions for brevity, of the annual sales of the more important products.

ANNUAL SALES OF GARDEN PRODUCE.

| | 1867. | 1868. | 1869. | 1870. | 1871. | 1872. |
|----------------|--------|---------|---------|---------|---------|-------|
| Strawberries, | £6 ... | £14 ... | £49 ... | £40 ... | £32 ... | } £37 |
| Other Berries, | 3 ... | 3 ... | 8 ... | 12 ... | 11 ... | |
| Rhubarb, | 7 ... | 13 ... | 17 ... | 15 ... | 38 ... | |
| Cabbages, | 47 ... | 95 ... | 12 ... | 25 ... | 16 ... | 3 |
| Potatoes, | 40 ... | 51 ... | 28 ... | 37 ... | 34 ... | 1 |
| Peas, | 14 ... | 6 ... | 10 ... | 3 ... | 4 ... | ... |
| Onions, | 8 ... | 8 ... | 15 ... | 6 ... | 24 ... | 35 |

The variety and tendency of our garden cropping will be best shown by the following table, which gives the extent of land under the different crops. But it must be borne in mind, that some of the land was under two crops; $5\frac{1}{2}$ acres, included in the table, also containing gooseberry bushes or other fruit trees, cabbages or other crops being grown between.

GARDEN CROPPING IN 1868.

| | Acres. | Roods. | | Acres. | Roods. |
|---------------------|--------|----------------|----------------|--------|----------------|
| Potatoes, | 5 | 1 | Strawberries, | 1 | $1\frac{1}{2}$ |
| Cabbages, | 2 | $1\frac{1}{4}$ | Fruit Trees,* | 0 | $1\frac{1}{2}$ |
| Peas, | 1 | 1 | Currants, &c., | 0 | $1\frac{3}{4}$ |
| Tares, | 1 | $0\frac{3}{4}$ | Rhubarb, | 0 | 1 |
| Onions, | 1 | 0 | Grass, | 0 | 3 |
| Carrots, | 0 | 3 | Roads, | 0 | $3\frac{3}{4}$ |
| Plantations, | 2 | $3\frac{1}{2}$ | | | |
| Cuttings and Seeds, | 1 | 0 | Total, | 20 | $1\frac{1}{4}$ |
| Young Thorns, | 0 | $2\frac{1}{4}$ | | | |

Many of the above quantities represent three or four

* Besides the $5\frac{1}{2}$ acres planted also with other crops, and included in the list.

The Garden Receipts increase.

different plots, and a few minor crops have been omitted. The fruit trees, it will be seen, occupied nearly six acres, but they did not do very well, though perhaps six years is too short a period, in which to judge of the success of a new fruit plantation.

In 1867, 8 acres of nice loamy soil were added to the garden land, and further extension was contemplated.

At this time the cropping sheet system (explained in another chapter) was just begun, and the gardener showed (on paper) such enormous profits per acre, that gardening threatened to oust farming altogether. Leeks were to clear £76 per acre, onions £66, and other crops in proportion.

Below, a few figures are given which will indicate the progress of the garden. Like that of the farm, it is a progress in the right direction, the sales per acre reaching £20 in 1871, the expenditure at the same time decreasing. The manure was almost entirely farm-yard:—

GARDEN ACCOUNTS.

| | 1864. | 1865. | 1866. | 1867. | 1868. | 1869. | 1870. | 1871. |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | £ | £ | £ | £ | £ | £ | £ | £ |
| Wages | 29 | 195 | 332 | 199 | 185 | 167 | 159 | 176 |
| Plants & Trees | 42 | ... | 132 | 50 | 16 | 49 | 13 | 27 |
| Manure | ... | ... | 12 | 27 | 52 | 54 | 59 | 47 |
| Sales of Produce | 12 | 105 | 176 | 249 | 209 | 162 | 215 | 412 |
| Stock in Dec. | ... | ... | ... | 128 | 269 | 466 | 554 | 467 |
| Profit | ... | ... | ... | 59 | 47 | 31 | 14 | 18 |
| Loss | 69 | 91 | 313 | ... | ... | ... | ... | ... |

It is easily seen that in the earlier years when planting &c., were active, the wages greatly exceeded the sales; but after 1866 there was a manifest improvement; so that in 1871 the sales were nearly three times as large as the wages. Indeed, the concern was then clearing itself, and perhaps might have been made really profitable in time. Our critic, however, thinks not; as he says "each succeeding year brought more weeds, more work, and consequently more wages to pay;

Irrigated Rhubarb and Strawberries.

and while such was the case, the fruit, which ought year after year to have increased in quantity, seemed to be all but an entire failure. Since Mr. Lawson sold the estate, I have had an opportunity of seeing the subsoil, and find it to be a clean gravel, thus giving at once a clue to the cause of the failure of the fruit." Certainly the land was, as our critic remarks, very foul by 1871; but that was an unusual year for weeds; and it is doubtful if, taking season for season, the land was much worse than in 1862.

The balance sheet for the whole period is given on p. 179. It shows a net loss of £339 11s. 11d., the land being valued as neither better nor worse; the £2,458 10s. 3d. transferred to Land and Buildings account, including £364 10s. 3d. worth of trees, plants, and other fixed stock. This loss, it will be noticed, occurred before 1867, the later years doing much better; but never making enough to pay rent, which, at £3 an acre, would have amounted to £60.

Latterly, a considerable extent of the garden land was devoted to farm crops, such as hay and oats, £229 of the sales in 1871 being for such crops; and this prevents a fair estimate of the gardening expenditure. Roughly divided, the wages averaged over the eight years £10 per acre, the manure £1 14s., the sales £11, and the loss (no rent or interest being charged) £2 6s. per acre. Much of the garden land could be reached by the irrigation hose, and to this we largely owe our success in growing rhubarb and strawberries, the latter crop, in 1869, growing £49 worth of strawberries on about one statute acre.

Market Garden Balance Sheet.

GARDEN BALANCE SHEET,

DR.

From 1864 to 1871, inclusive.

CR.

| Land from Land and Build- ings Account, . . . | £ 2094 | 0 | 0 | Sales of Produce, . . . | £ 1632 | 8 | 6½ |
|--|--------|----|-----|----------------------------|--------|----|----|
| Wages, . . . | 1462 | 7 | 0½ | „ Sundries, . . . | 6 | 10 | 6 |
| Horses, Harness, &c., . . . | 102 | 1 | 7 | Stock transferred to Land | | | |
| Implements, . . . | 14 | 14 | 7 | and Buildings, . . . | 2458 | 10 | 3 |
| Joiner, &c., Accounts, . . . | 6 | 16 | 3 | Stock on hand, 1872, . . . | 0 | 5 | 0 |
| Steam Thrashing, . . . | 5 | 0 | 4 | Balance, being Loss, . . . | 339 | 11 | 11 |
| Hose for Irrigation, . . . | 12 | 1 | 6 | | | | |
| General Account, . . . | 106 | 9 | 1½ | | | | |
| Tavelling Expenses, . . . | 27 | 19 | 3 | | | | |
| Railway Carriage, . . . | 5 | 2 | 8 | | | | |
| Trees, . . . | 37 | 13 | 9 | | | | |
| Plants and Seeds, . . . | 290 | 7 | 11½ | | | | |
| Hedging and Railings, . . . | 9 | 2 | 5 | | | | |
| Bags, Mats, &c., . . . | 4 | 14 | 2 | | | | |
| Manure and Lime, . . . | 251 | 16 | 1½ | | | | |
| Bees, . . . | 2 | 14 | 10½ | | | | |
| Poultry, . . . | 2 | 0 | 0 | | | | |
| Rents, . . . | 2 | 4 | 7 | | | | |
| | £ 4437 | 6 | 2½ | | £ 4437 | 6 | 2½ |

CHAPTER XI.

MANUFACTURING PROFITS AND LOSSES.

VI. MANURE WORKS.—Beginning as high farmers we soon became large purchasers of manures: and as bones are, and have always been, a favourite manure with farmers, several cargoes were purchased, and a bone mill set up for grinding them. Naturally, too, the dissolving of bones followed, but this was a more ticklish operation; and being also a disagreeable one, it was left to the management of the labourers employed. Dissolved bones, or bones mixed with water and vitriol, always form a nasty, sticky, damp compound, difficult and disagreeable to sow as a manure. The labourers, however, made matters worse by adding salt to the boiling, bubbling mass, produced by the addition of vitriol to the bones. This was useless, and worse than useless, in more ways than one; for it wasted acid and gave rise to a sharp and suffocating gas. It also caused the formation of a little calcic chloride, which, having an eager affinity for water, made it impossible ever to make the manure dry. The men, however, thought that the sharp gas given off was a “grand sign,” and as one of them had once before worked in a manure factory, no one felt competent to correct him. To dry the pasty mass thus produced, recourse was had to quicklime, which certainly was the most powerful drier they could have found. It had, however, two faults, both very serious indeed; the first was, that it expelled as ammonia gas, the costly nitrogen, worth over £2 in each ton of bones; the second, that it undid the chemical effect of the acid; and when added in any quantity, so “brought back” the soluble phosphates, that the resulting compound represented a mixture of undissolved bone and gypsum; but the latter, which resulted from the action of the sulphuric acid on the lime, and which could have been bought for 15s. a ton, was by this process being made at a cost of about £4 a ton. After the chemist came, the busi-

Honest Dealing proves Unprofitable.

ness was put partly under his management in the spring of 1866; but beyond stopping the use of salt and lime, he did not then feel competent to undertake the entire charge. In 1867, however, after a complete change of hands, the manufacturing was transferred to the old farm-steading, where water-power was available, and a new start was made. One of Carr's disintegrators was purchased for £75, and a system of mixing special manures was begun, which ended only with the sale of the estate in 1871.

At an early date a portion of the manures was sold to neighbours, the returns from this source amounting in 1866 to nearly £1,200. This was, however, entirely for bones ground and dissolved; and as the balance was only £64 on a turnover of £2,760 (no interest being charged), it is evident that these were sold at a very poor profit: indeed, one cargo, of which pretty full details have been preserved, showed an expense of about 21s. per ton on bones purchased at Maryport and brought to Blennerhasset, and then ground and kept for a few months. Much of this expense was due to a loss of weight by evaporation; which was estimated, from some trials, to equal nearly a ton per month on a cargo of about 130 tons. To prevent this loss, manure dealers generally salt the bones; but Mr. Lawson declined to do this, unless he advertised "bones and salt for sale." The result was, that, as we were unable to sell at the same price as the regular dealers, only a few farmers whose judgment, or perhaps, rather, whose faith in our honesty exceeded their love of a bargain, continued to purchase our ground bones. Disappointed at receiving such poor encouragement, and unable always to use a full cargo ourselves, Mr. Lawson decided in 1867 not to purchase any more bones. The chemist also advised this; preferring the dissolved coprolites; as equal in effect to dissolved bones for most purposes, and yet much cheaper and also better to work with, being always drier and finer in condition.

In starting this new system we expected to win the confidence of our neighbours by strict honesty in our dealings, and by perfect openness, both in the manufacturing of the manures and in the keeping of the accounts. This confidence

Difficulties with the Agency System.

probably might have been won, but for the agency system, which was at that time becoming so excessively developed, that nearly every tenth farmer was a manure agent. Several offers of manure agencies from Liverpool and Manchester houses were made *to us* ; £2 a ton commission on £8 being offered in one case, or if preferred, 10 tons would be sent for every 8 tons ordered and invoiced. Many, too, were the offers of would-be agents for our manures ; but the system of cash payments and small profits which Mr. Lawson desired and largely adopted, prevented our accepting these offers. In 1867, however, one exception was made, and $2\frac{1}{2}$ per cent. (equal to about 5s. per ton) was promised to a neighbouring friend, whose business took him much among the farmers, and who had broached the subject to us more than once. The result was, however, very few orders ; and he finally told us that when he could get about 15s. per ton on other manures, he could not be expected to sell ours, except he could do no better. After this, the sales to farmers averaged about £600 annually ; the trade being but little pushed, beyond the sending out of two or three hundred circulars by post at the beginning of each season.

1867 was the only year in which this department showed a balance on the wrong side ; and this was occasioned by the following misfortune. In Liverpool our purchases of manure stuffs had been made chiefly through one firm of brokers, with whom experience had made us well satisfied. From them, in the spring of this year, we ordered 30 tons of bone ash and 14 tons of nitrate of soda, the value of which was over £300. As, however, we wanted some 20 tons of feeding meal besides, we asked them to look out for a coasting vessel to take all at once to Maryport. We thus delayed the despatch of the goods, which usually arrived at our station within six or seven days after order. The terms were cash fourteen days after purchase ; and as they sent us the usual contract form to the effect that they had purchased the goods for us, we hesitated only a little, when asked on March 2nd to forward them £250 to account, seeing that already sixteen days had expired and the delay had been on our part. We were consequently not a little astonished

Our Cash and Credit Systems.

when, a few days afterwards, a lawyer's intimation arrived to the effect that the firm was bankrupt. The chemist was immediately despatched to Liverpool to see after the goods, but found that the contract was a lie, and that nothing at all had been purchased. The chemist was anxious to consult a lawyer, and was advised to do so by business friends in Liverpool; but Mr. Lawson had warned him against incurring lawyers' fees and bills; so, after trying the effect of a few threats, he was glad to go back with a promise from the *sole member* of the firm to call on Mr. Lawson in a few days. This promise he kept, and the money too; as we never recovered any of it. This was the only bad debt of any consequence experienced in the ten years; which is more than can be said of most businesses of a like extent.

At first, in this business, we had followed the usual system of allowing credit sales, but had limited the period to three months. In 1868, however, Mr. Lawson decided on cash payments; and a circular was sent to every customer, giving notice of the necessity of prepayment. This gave great dissatisfaction; and was, along with the giving up of the bone trade, the chief cause why the sales of that year proved about £800 less than those of 1867. This decrease, accordingly, led the chemist in September of that year to propose at the weekly meeting, that there be a credit price for manure; this was carried by 27 votes against 10; but only agreed to by Mr. Lawson, on condition that the difference should be so high, that no one would pay it. Future price circulars, in consequence, published a credit list 15s. per ton higher than the cash prices; and though the sales increased a little, they never again exceeded £700 in any one year.

The farm was the largest customer, and much therefore of the manure profits fairly belong to it. That they were not made at the expense of the farm, by charging a high figure for an inferior article, may be judged from the following facts. The first is a comparison between the published guaranteed composition of our wheat manure, and that of a neighbouring company's, the members of which were chiefly tenant farmers.

The Bailiffs Test our Manures.

COMPARATIVE VALUE OF TWO WHEAT MANURES.

| | COMPANY'S MANURE. | | | OUR MANURE. | |
|-------------------------------|-------------------|-------------|--------|--------------|---------|
| | Price. | Analysis. | Value. | Analysis. | Value. |
| Sulphate of Ammonia, | 4/3 | 24 p. cent. | £5 2 0 | 27 p. cent., | £5 14 9 |
| Soluble Phosphates, 4/3 | 10 | „ | 2 2 6 | 14 „ | 2 19 6 |
| Insoluble „ | 2/0 | 8 „ | 0 16 0 | — | — |
| Alkaline Salts, 0/3 | 20 | „ | 0 5 0 | 6 „ | 0 1 6 |
| Analytic value per ton, . . . | | | £8 5 6 | | £8 15 9 |

The company's manure was offered at £10 per ton, but this might equal £9 5s. to *members*. Our manure, on the other hand, was offered to every one at £8 15s.; though, as has been seen, its value was 10s. 3d. per ton greater than the company's manure. It is, however, but fair to add, that some others of the company's manures more nearly equalled ours; but in no case, within my knowledge, did any other trader make an equally good offer to the farmers.

Other comparisons available on this point were furnished by two of our bailiffs, who, for their own satisfaction, tested some outside manure against our own. In each case, the trial was carried out by the farm people, who, having some little jealousy of the manure business, were not inclined to favour it too much. In 1867 Proctor and Ryland's—a good and reliable manure for turnips—was tried, “value for value,” (but in what quantities there is no record, as is usually the case in rough and ready farm experiments). The weights of the rival crops, taken on one-fortieth of an acre, equalled per acre 29 tons 15 cwts. from P. and R.'s, and 31 tons 5 cwts. from our own manure. The other trial was made in 1870 by our third farm bailiff. The weight used of each manure is unknown, but the test was “value for value.” The rival manure was obtained from the same tenant farmer's company before mentioned; and the weight of turnips from an equal number of stitches (size unrecorded) was 41 $\frac{1}{4}$ cwts. for the company's and 45 cwts. for our own manure. The differences are trifling; showing that the opposition manures were good: and it is only what one would expect, that the manures made specially for our soil should show the better result.

Manure Business Balance Sheet.

Dr. MANURE WORKS—BALANCE SHEET FROM DEC. 1865 to 1873. Cr.

| | | | | | | | |
|---|---------|----|------------------|---|---------|----|-----------------|
| To Buildings and Machinery from Land and Buildings Account, . . | £429 | 0 | 0 | By Sales of Manure, . . | £11,945 | 3 | 9 $\frac{3}{4}$ |
| " Alterations of Buildings, . . | 17 | 10 | 4 | " Sale of Machinery, &c., . . | 81 | 17 | 0 |
| " Machinery, . . | 99 | 12 | 5 | " Buildings, Machinery, &c., transferred to Land and Buildings Account, . . | 230 | 0 | 0 |
| " Stock from Farm Account, Dec., 1865, . . | 1980 | 0 | 0 | | | | |
| " Manure Stuffs Purchased, . . | 7610 | 13 | 10 $\frac{1}{2}$ | | | | |
| " Wages, . . | 334 | 8 | 8 $\frac{1}{4}$ | | | | |
| " Grinding by Engine in 1866, . . | 83 | 2 | 6 | | | | |
| " Travelling Expenses, . . | 11 | 5 | 3 $\frac{1}{2}$ | | | | |
| " Railway and Shipping Freight, . . | 557 | 4 | 3 $\frac{1}{2}$ | | | | |
| " Bags, . . | 242 | 15 | 3 | | | | |
| " Bad Debt in Liverpool in 1867, . . | 250 | 0 | 0 | | | | |
| " Experiments in 1870, . . | 54 | 17 | 2 $\frac{1}{2}$ | | | | |
| " Discounts, . . | 47 | 6 | 0 $\frac{1}{2}$ | | | | |
| " Sale Expenses, . . | 2 | 0 | 0 | | | | |
| " General Account, . . | 302 | 7 | 7 $\frac{1}{2}$ | | | | |
| " Balance, being Profit, . . | 234 | 17 | 3 $\frac{1}{2}$ | | | | |
| | £12,257 | 0 | 9 $\frac{3}{4}$ | | £12,257 | 0 | 9 $\frac{3}{4}$ |

Annual Details of the Manure Business.

Our manures, however, laboured under one disadvantage which disinclined us to push their sale much. This was, that, being intended as entire substitutes for farm-yard manure, it was found essential to add more potash than was perhaps profitable for ordinary farming. Of course this made them unnecessarily expensive for some soils; and every one could not find them the best for his land and system of farming. But experiment showed them to be the very best for our own soil; and indeed it was from experiment on that soil that they were composed.

Another circumstance disinclining us to a large trade, was the poor accommodation, in the way of buildings and power, at the old farm steading. These, in the spring, were often found so inadequate for the farm supply alone, that shortly after the fire, it was determined to transfer the works to the new farm buildings, where power was abundant.

The accounts are given below. Up till the end of 1871 they show a net profit of £467; but the sale of the estate in that year necessitated a forced sale of the remaining stock, which reduces this profit to about £234.

BRIEF ABSTRACT OF THE MANURE WORKS' BALANCE SHEETS,
FROM DEC., 1865, TILL 1872-3,

| | 1866. | 1867. | 1868. | 1869. | 1870. | 1871. | 1872-3. |
|--------------------------|-------|-------|-------|-------|-------|-------|---------|
| Stock in | £ | £ | £ | £ | £ | £ | £ |
| Buildings, . . . | .. | .. | .. | 265 | 260 | 230 | 210 |
| Machinery, . . . | .. | .. | 169 | 180 | 213 | 179 | 154 |
| Manures, . . . | 1980 | 1442 | 1335 | 1183 | 705 | 691 | 495 |
| Manures, &c., Purchased, | 1922 | 1769 | 769 | 555 | 1484 | 1288 | 60 |
| Rail Carriage, &c., . | 25 | 137 | 70 | 61 | 126 | 128 | 8 |
| Wages, . . . | 126 | 111 | 67 | 60 | 89 | 90 | 54 |
| Engine Power, . . . | 83 | .. | .. | .. | .. | .. | .. |
| Field Experiments, . | .. | .. | .. | .. | 55 | .. | .. |
| Building, &c., . . . | .. | 23 | 15 | 48 | 23 | .. | .. |
| Sundries, . . . | 2 | 269 | 13 | 4 | 24 | 30 | 26 |
| Total Expenditure, - | 4138 | 3751 | 2438 | 2356 | 2979 | 2636 | 1007 |
| Total Receipts, . . | 4202 | 3604 | 2554 | 2480 | 3146 | 2780 | 774 |
| Loss, . . . | .. | 147 | .. | .. | .. | .. | 233 |
| Profit, . . . | 64 | .. | 116 | 124 | 167 | 144 | .. |

A Flax Scutching Mill.

The figures of 1866 are defective; buildings and machinery not being then included, and stock taking being but a rough estimate; 60 tons of dissolved bones were valued at about selling price, and the January following shows a loss. This, however, is partly due to the Liverpool mishap of £250 before referred to (which is in the above included in the sundries line for 1867).

After 1869 it is noteworthy that in this department an attempt was made to reduce the fixed stock, the buildings and machinery being valued in 1872 at £108 less than in 1869. The stock of manures was also less towards the end, experience having taught us to arrange our purchases better. Thus in 1872 it was only one-fourth what it was in 1866, but still quite large enough to cause a considerable loss in closing the business. The stock of manures realised, however, more than 80 per cent. of the valuation price: but the machinery brought less; and the after-expenses of wages, etc., all combined to produce a loss of £233 on closing the business. This, however, still leaves a profit over the whole seven years of £234; thus placing the manure business second of the three paying departments of the establishment. The detailed balance-sheet for the whole period is given in page 867.

VII. STEAM PLOUGH.—Of this nothing need be said, Chapter IV. having very fully dealt with it.

VIII. FLAX MILL.—Soon after Mr. Lawson began farming, a friend of his—a linen manufacturer—proposed that he should grow flax straw, and made him very liberal offers for good crops. He also advised his starting a scutching mill. This, however, was delayed till the crop itself should be tried. The flax obtained the first year was very fair, being grown under the superintendence of the gardener, who had had some previous experience of it in Ireland. It was, in consequence, decided in 1866 to investigate the question of manufacturing, and the chemist was sent over to Ireland in February that he might inspect and advise as to the best machinery, the method of steeping, &c. After seeing

A Midnight Assault.

through some of the town and country mills near Belfast, and visiting Friedlander's flax mill at Knockcloughrim, county Derry, he advised the purchase of three of Friedlander's machines, at a cost of about £60. Rettores in which to steep the flax were also constructed at a cost of about £180, these being dug at such a level as at once to receive the rain water from some of the roofs, and at the same time to be drainable into the liquid manure tanks.

Some 200 pamphlets on flax-growing were now obtained from the N. E. Agricultural Association of Ireland and distributed among the neighbouring farmers, accompanied by a notice offering from £7 to £20 an acre, or from 3d. to 9d. per stone for the flax straw. In July an Irish scutcher arrived from Knockcloughrim; and under his directions part of the Dutch barn was boarded off, and the scutching mills got in gear; and all was in readiness to start by the time the straw was steeped and grassed. At first all went well; but soon a difference of opinion arose. The flaxman thought his flax the most important thing about the place, and the farm bailiff did not; and when the flax had to be lifted out of the rettores, and hands and horses were required from the farm bailiff, he did not facilitate the work. Thus the business did not flourish; and the end of the first year showed a loss of £61 18s. 3d. This difficulty grew more unsatisfactory, till in June, 1867, the flaxman was discharged at the instance of the farm bailiff. The flaxman, now that his day was over, waylaid the bailiff, one night about 11 P.M. at a place where a small stream crossed the road, near a large tree which cast a deep gloom on the road beneath, rendering the place peculiarly favourable for an assault. The details of that encounter at the stream were never known with certainty, as the farm bailiff and the Irishman gave different accounts. The flax business did not recover, and the end of the second year showed a loss of £143. The scutching was now done entirely by Cumberland hands, chiefly women, who had picked up the business with great aptitude. In the following year, with a new farm bailiff, things improved a little, but the business had now a bad name, and it was rather neglected. The

A Starch Mill Wanted.

loss for 1869 was, nevertheless, only £43; but it was decided to give up the manufacture; and scutching was continued into 1870, only to use up the stock of flax straw already on hand; but after 1869 no more straw was purchased. The accounts, which were finally closed in 1870, show a total loss of £330 over the five years.

FLAX WORKS.

| DR. | BALANCE SHEET, FROM 1865 TO 1871. | | CR. |
|---|-----------------------------------|--|--------------|
| To Flax Tanks, &c. (From Land and Buildings Account) £268 0 0 | | By Sales of Scutched Flax, - - £321 18 4½ | |
| „ Flax Straw bought, 400 1 5½ | | „ Do. Linseed, - 145 4 0½ | |
| „ Wages, - - 304 8 1 | | „ Stock on hand, - 145 16 0 | |
| „ Chemicals, - 5 7 10 | | „ Loss by Fire, charged General | |
| „ Machinery, - 31 11 10½ | | P. & L. Account, 107 17 0 | |
| „ Travelling Expenses, 3 17 2 | | „ Balance being loss, 330 17 6½ | |
| „ Railway Carriage, 26 5 9½ | | | |
| „ Advertising, - 0 9 6 | | | |
| „ General Expenses, 11 11 3 | | | |
| | £1051 12 11½ | | £1051 12 11½ |

IX. STARCH MANUFACTURE was the last new business we undertook: and as it was begun under the compulsion of circumstances, it was with great unwillingness that we started our farina or starch mill. The case stood thus: in 1871 we had 100 acres of potatoes, of a probable value of nearly £2000, and which, early in August, showed unmistakable signs of being much diseased. Anxious co-operators who, the year previous, had tasted £10 of bonus money, walked over the farm, and, pulling 'up the potato tops in different parts, counted the diseased roots and the good ones. Dismal tales were circulated of three-fourths being diseased; which, with the already heavy blow of the great fire the same autumn, made the prospects of another bonus poor indeed. Parliaments and councils talked the matter over, and starch mills were mentioned as a profitable way by which the healthy portions of the diseased potatoes could be utilised; but the nearest mill was eighty miles away, and £1 per ton for railway carriage exceeded the price offered at the mills. Enquiries were then made as to the cost of a starch mill, and

Difficulties with the Diseased Potatoes.

£40 being mentioned, it was finally decided to send the chemist north to inquire into the matter. From Glasgow he reported that £150 at least would be necessary for the proper machinery, but that £20 of this might be saved by the immediate purchase of a second-hand machine then offering in Glasgow. When, however, he returned, the price seemed to have damped the council, and Mr. Lawson had gone from home. As the offer required a speedy answer he followed Mr. Lawson next day, and induced him to make the purchase the same night by telegram.

For working a starch mill we had already numerous advantages, which dispensed with nearly half the cost. Water-power and wash-water were abundant, and of old iron piping, shafting, and pulleys from the irrigation and flax works, there was nearly as much as would be required. A kiln was, also, already built, and the large flax tank was admirably suited for a pulp holder. Indeed but for these facilities it may be safely said we should never have ventured on this enterprise.

A Glasgow gentleman (Mr. John Dalglish) who had greatly improved many processes of the farina manufacture in Scotland, took an interest in our co-operative farm, and very kindly came, and not only gave freely the best of his experience, but planned the greater part of the gearing; and when the manufacture proved much more difficult and delicate than we had anticipated, but for his continued kindness we should have been at a standstill more than once.

It was late in September before the order was given for the machinery: nevertheless work was begun before the end of October. But by this time many of the potato heaps had already heated, and sunk in the centre to a black rotten mass. The crop, also, proved short of our expectations; and instead of 500 or 600 tons, only about 300 tons were furnished by the 100 acres. An attempt was made to purchase some diseased potatoes for the starch mill; but Cumberland being principally a turnip county, only some four tons were obtained. Then followed the sale of the estate, which, of course, meant only one year's trial of the farina mill; and the workers were further assured that it

The Starch Mill Machinery.

would not show a profit, by the council's voting £1 per ton as the price to be credited to the farm for all diseased potatoes, good, bad, or indifferent; although 8s. per ton was the price being paid at the regular mills in Scotland.

The machinery and apparatus worked well, and attracted many visitors; who were generally most interested in the *shaker*, a machine in which a long heavy sieve was shaken backwards and forwards 130 times a minute, sliding so as to strike its iron-shod ends against the iron-bound frame: the noise near it was deafening, which seemed the great source of attraction to the visitors. Another part of the machinery which attracted much notice, was the large churn, ten feet in diameter and six feet deep, where the impure farina was churned up with some chemicals and water, and then washed with pure water repeatedly till white enough. To save expensive gearing, the vertical shaft of this churn was driven by a twisted belt from a horizontal shaft, a device planned by our clerk, who had formerly been one of our steam plough enginemmen. It was always a puzzle to the natives why the belt did not fall off the large horizontal pulley. The kiln mentioned was in connection with the gas-house; and though at first it promised well, it proved very slow in action, and delayed us much. The first cwt. of dried farina was a nine days' wonder, being visited by all the curious of the neighbourhood; and the croakers and prophets of evil were by it almost silenced; but not wholly so, until receipt of the first cheque for a sale of nearly £300. Only 24 tons of farina were obtained from the 290 tons of diseased potatoes pulped; perhaps four or five tons more might have been extracted, but that the sale of the estate and machinery prevented our making the latter as complete as it ought to have been, and also made us hurry the manufacture.

The whole business shows a loss of £307, about £150 of which is due to the sale of the new machinery by valuation, only £62 having been allowed for £195 of new machinery, and a very considerable amount of old machinery and cast-iron piping.

Under all these disadvantages, and with only a first year's experience, but little can be said as to the profitableness of

The Minor Departments.

this business. With more experience, a higher quality of farina could have been obtained, and the working expenses would have been much reduced.

STARCH MILL.

BALANCE SHEET FROM OCT., 1871, TO JUNE, 1872.

| Dr. | | | | | | | | | Cr. |
|--------------------------|---|-----|----|----|--|--|--|--|---------------------------------|
| To Machinery & Oil, | £ | 190 | 16 | 8 | | | | | By Sales of Starch, . £353 11 0 |
| „ Buildings, . . . | | 4 | 0 | 8½ | | | | | „ „ Brock, . . . 1 1 0 |
| „ Cement, . . . | | 0 | 4 | 0 | | | | | „ Starch-Cart Sold, . . . 5 0 0 |
| „ Potatoes, . . . | | 323 | 16 | 5 | | | | | „ Sundries, . . . 3 12 4 |
| „ Chemicals, . . . | | 2 | 1 | 6 | | | | | „ Machinery trans- |
| „ Wages, . . . | | 73 | 7 | 6 | | | | | ferred to Land & |
| „ Travelling Expenses, . | | 2 | 12 | 10 | | | | | Buildings Account, 62 2 9 |
| „ Cartage, . . . | | 32 | 10 | 3 | | | | | „ Balance, being Loss, 307 9 11 |
| „ Bags, . . . | | 16 | 6 | 0 | | | | | |
| „ Coal, . . . | | 24 | 16 | 5 | | | | | |
| „ General Account, . | | 61 | 6 | 0 | | | | | |
| „ Sale Expenses, . . . | | 0 | 18 | 8½ | | | | | |
| | £ | 732 | 17 | 0 | | | | | £732 17 0 |

X.—THE MINOR DEPARTMENTS of our establishment included the joiner's shop, the smith's shop, the gas works, and the store room; all of which subdivisions were made in 1867; the separation being to facilitate the apportioning of their cost against each of the larger departments. The loss shown by them should, therefore, really be charged against the other departments; in the proportions, say, of £80 to the farm, £80 to the steam plough, £40 to land and buildings, and the odd £17 to the manure works.

The joiner's shop usually kept two men busy, and sometimes more, especially when cottages were being built.

The smithy kept one man at work, and another half his time; though, when the steam engines were at home, it was no uncommon thing to see four or five all busy over the iron.

The gas works were generally managed by the man who assisted in the smithy. They supplied gas not only to the farm, but to the village, which was distant about one-third of a mile to the east. At first, the villagers in general welcomed it; but when their quarterly gas bills were presented,

The Flax Shoves make bad Gas.

many of them stoutly denied having burnt so much (the meter, notwithstanding), and many of them went back to candles, finding it easier to pay 1d. occasionally for a dim light, than 3s. or 4s. quarterly for a good one.

The chemist was at one time the occasion of an amusing incident in connection with the gas supply. He had advised a trial of flax shoves for gas making, these shoves being quite useless for any purpose whatsoever. Accordingly, the gasman wheeled in a quantity of shoves to the gas-house; and was delighted to find them make gas so quickly, the gas holder filling in a few hours. But when the villagers began to light up their houses, after the first few seconds of good gas (from that previously in the pipes), the lights speedily turned blue; and for that night, at any rate, candles were brighter than gas light. These shoves were the refuse woody matter of the flax straw obtained in the scutching process; but being deficient in oily matter, the gas was quite wanting in the heavier hydro-carbons, and burned with a blue flame, like that of a spirit lamp.

The price charged for our gas was 6s. 8d. per 1000 feet; but it did not pay us at this price, a result due chiefly to the smallness of the demand: as the same expense of manufacture, and the same size of piping would have sufficed for a very much larger consumption.

MINOR DEPARTMENTS.

BALANCE SHEET FROM 1867 TO 1872.

| Dr. | | Cr. |
|-------------------------------|------------|--------------------------------|
| To Wood from Land | | By work done and ma- |
| and Buildings, £28 0 0 | | terials sold, £1372 10 0 |
| „ Iron, . . . 283 19 2 | | „ Gas consumed and |
| „ Wood, . . . 226 10 5½ | | fittings sold, . . . 166 17 3 |
| „ Paint, Varnish, | | „ Transfer to Land & |
| Oil, &c., . . . 17 8 9 | | Buildings Ac- |
| „ Coal, . . . 117 6 8 | | count, . . . 8 0 0 |
| „ Gas, . . . 9 1 11 | | „ Stock on hand, . . . 0 13 6 |
| „ Wages, . . . 976 3 8 | | „ Balance being loss, 217 15 3 |
| „ Railway Carriage, 21 16 11½ | | |
| „ General Expenses, 81 19 2 | | |
| „ Sale Do., . . . 3 9 3 | | |
| | <hr/> | <hr/> |
| | £1765 16 0 | £1765 16 0 |

Management of the Newcastle Shops.

CHAPTER XII.

SHOPKEEPING AND OTHER VENTURES.

XI. THE NEWCASTLE SHOP.—A previous chapter contains a sufficient history of this business, and but little need be added here, except a few details of the annual sales.

SOME DETAILS OF THE NEWCASTLE BUSINESS.

| | 1866. | 1867. | 1868. | 1869. | 1870. | 1871. | 1872. |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|
| | £ | £ | £ | £ | £ | £ | £ |
| House Property, . . . | 625 | .. | .. | 31 | 30 | 18 | .. |
| Cattle, &c., Purchased, . | 805 | 837 | .. | .. | .. | .. | .. |
| Milk from Blennerhasset, . | 376 | .. | .. | .. | .. | .. | .. |
| Vegetables „ . . . | .. | 66 | .. | .. | .. | .. | .. |
| Wages, | 18 | 73 | .. | .. | .. | .. | .. |
| Rates and Taxes, . . . | .. | 24 | 4 | 11 | 8 | .. | 29 |
| Stock (including House), | 768 | 761 | 705 | 710 | 600 | 600 | 630 |
| Rents Received, . . . | 23 | 15 | 39 | 36 | 41 | 44 | 34 |
| Sales, | 818 | 1004 | .. | .. | .. | .. | .. |
| Loss, | 415 | 15 | 54 | .. | 112 | 8 | .. |
| Profit, | .. | .. | .. | 5 | .. | .. | 54 |

The first two years show a perfect fever of trade. Not content with the shop on our own property in Pine Street, another was taken in the market, and the trade pushed to considerable loss. However, after two years of this, but for the property we had purchased there, we should have given up the business. As it was, we tried a new plan, giving the shopman £60 of capital, on which he was to trade, and pay rent, wages, and profit. On this new basis the next year showed a loss of £54; and the year after (just when we had decided to let the shop) a profit of £5. We, however, closed the business: and the figures after 1869, refer wholly to the house property; the £112 loss of 1870 being due to a reduction of £110 on the previous high valuation of £710.

The Carlisle Shop a heavy Loss.

The charges in the first line of £31, &c., for the house property, were paid to the town authorities for paving; so that the property cost us, on the whole, £704; but we eventually sold it, in 1872, for £630. The property, besides the shop, contained dwelling houses; hence the item of rents appear for every year.

When we let the shop in 1869, the tenant seemed a decent painter and paper-hanger; and consequently, we were astonished, some months afterwards, to learn from an anonymous letter, that our tenant had made the shop into a public-house. We made immediate inquiries, and found that he indeed sold beer, but that it could not be called a public-house. We, however, gave him notice to quit, but neglected to enforce it at the proper time, and I rather think he is there yet.

NEWCASTLE SHOP AND PROPERTY.

| DR. | BALANCE-SHEET FROM 1866 TO 1872. | | | CR. |
|---|----------------------------------|------|------------------------------------|-------------|
| To Cost of Buildings, £704 | 9 | 10½ | By Sales in 1866-7, £1,821 | 10 6 |
| „ Cattle, Sheep, & Pigs, in 1866-7, 1,641 | 10 | 1½ | „ Rents, | 243 3 10½ |
| „ Milk in 1866, 376 | 6 | 2½ | „ Sale of Pony and Cart, | 14 10 0 |
| „ Butter in 1866, 5 | 5 | 6 | „ Sale of Shop Fixtures, | 7 15 0 |
| „ Vegetables in 1867, 66 | 1 | 10 | „ Sale of Property, 630 | 0 0 |
| „ Wages for 1866-7, 91 | 11 | 2 | „ Balance, being | |
| „ Travelling Expenses, 18 | 19 | 7 | Loss, | 544 10 2 |
| „ Railway Carriage, 62 | 17 | 6 | | |
| „ Rent, Rates, & Gas, 76 | 7 | 4 | | |
| „ Sundries, | 218 | 0 5 | | |
| | £3,261 | 9 6½ | | £3,261 9 6½ |

XII. THE CARLISLE SHOP is but a repetition of the Newcastle shop. It, also, was begun as an outlet for our milk, cattle, and vegetables; and was soon put on an independent basis, with a floating capital of £50. At first pure milk was its “specialite,” and a very good trade was done; but the cattle trade was mismanaged; and latterly neither the milk, the vegetables, nor the meat, were any credit to us. The balance-sheet shows a total loss of £200—more than half of which belongs to 1867. It was closed in 1868: but for 1869 it shows a profit of £33, the result of the recovery of several bad debts.

The Blennerhasset Shop alone proves Profitable.

CARLISLE SHOP.

| DR. | | | | BALANCE-SHEET FROM 1866 TO 1869. | | | | CR. | | | |
|--------------------------------------|--------|----|----|----------------------------------|--------|----|---|--------|----|---|--|
| To Fixtures, . . . | £24 | 2 | 2½ | By Sales, . . . | £1,258 | 14 | 3 | | | | |
| „ Pony and Cart, . . . | 10 | 0 | 0 | „ Stock on hand, . . . | 2 | 1 | 6 | | | | |
| „ Floating Capital, . . . | 50 | 0 | 0 | „ Balance, being . . . | | | | | | | |
| „ Cattle, Sheep, & Pigs, . . . | 947 | 1 | 2 | Loss, . . . | 200 | 17 | 4 | | | | |
| „ Milk, . . . | 277 | 15 | 3 | | | | | | | | |
| „ Butter, . . . | 4 | 3 | 5 | | | | | | | | |
| „ Potatoes and Garden Produce, . . . | 41 | 11 | 2½ | | | | | | | | |
| „ Wages, 1867, . . . | 11 | 10 | 0 | | | | | | | | |
| „ Rent, Rates, and Taxes, . . . | 78 | 8 | 5 | | | | | | | | |
| „ Railway Carriage, . . . | 9 | 6 | 6 | | | | | | | | |
| „ Milk Barrels, . . . | 5 | 10 | 2 | | | | | | | | |
| „ Collecting Accounts, . . . | 1 | 3 | 3 | | | | | | | | |
| „ General Account, . . . | 1 | 1 | 6 | | | | | | | | |
| | £1,461 | 13 | 1 | | | | | £1,461 | 13 | 1 | |

XIII. THE BLENNERHASSET SHOP business has been already referred to in a previous chapter. It was always rather a pet with Mr. Lawson; and its short-comings (£105 the first three years) were patiently endured. Our critics frequently said we could not keep a shop; and before 1870 it was true: for, though 1867 showed a profit, it was a doubtful one. But 1870 cheered our hearts with an undoubted profit of about £2; 1871 a profit of £24; and 1872, £36:—demonstrating conclusively that we could keep one. This shop was tried under three different storekeepers, the two latter of whom were elected by universal suffrage. The present shopkeeper, however, and the one who has made it pay, would have been put in, two years earlier, but for universal suffrage.

The balance sheet shows a loss of £43, all of which occurred in 1868 and 1869; its progress, since, being one of uninterrupted prosperity. For the size of the village, it has done a large business, the sales amounting to nearly £5,000.

This business, as has been already mentioned, has been made into a limited liability concern; which pays 7½ per cent. to its shareholders; and besides, a bonus on all purchases, irrespective of membership. It is still flourishing.

The People ask for a Shop at Ireby.

BLENNERHASSET SHOP.

| DR. | BALANCE SHEET FROM 1866 TO 1872. | CR. |
|--------------------------|----------------------------------|------------------------|
| To Stock, . . . | £42 9 3½ | By Sales and Dis- |
| „ Goods bought, . . . | 4,692 14 10 | counts, . . . |
| „ Wages, . . . | 111 1 9 | „ Sundry Debtors . . . |
| „ Travelling Ex- | | „ Value of Shares |
| penses on two | | in Scottish |
| years, . . . | 21 8 11 | Co-operative |
| „ Railway Car- | | Society, . . . |
| riage, . . . | 43 0 2 | „ Accumulated |
| „ Rent and Gas, . . . | 50 1 8 | Dividends & |
| „ Coal, . . . | 3 11 6½ | Interest in the |
| „ Licenses, . . . | 5 4 0½ | above, . . . |
| „ Fixtures, . . . | 5 16 3 | „ Balance, being |
| „ General Account, . . . | 29 10 9 | Loss, . . . |
| „ Investment | | |
| Scottish Co- | | |
| operative | | |
| Wholesale | | |
| Society, . . . | 25 0 0 | |
| „ Sundry Credit- | | |
| ors, . . . | 234 15 3 | |
| | £5,264 14 5½ | £5,264 14 5½ |

XIV. THE IREBY SHOP.—When the balance sheets of 1867 showed an apparent profit of £20 on the Blennerhasset shop, the shop party revived; and though the Newcastle and Carlisle branches showed, that same year, a loss of £15 and £103, yet a motion was brought before the parliament “that we should extend our shopkeeping business.” This motion was, however, negatived by 25 votes against 9.

The question was then carried to Ireby, a village near Mr. Lawson’s former Prior Hall estates; and where, in 1864 and 1866, he had held two co-operative meetings. On Monday, June 15th, 1868, he held a meeting, at which it was proposed “That it is desirable that Mr. Lawson open a shop in Ireby.” It was opposed by the village schoolmaster, and by Messrs. Hunter and Tiffin from Blennerhasset, who advocated a co-operative store by the people themselves. The meeting, however, adopted the motion by a majority of 22. Eleven candidates were nominated the same evening for the office of storekeeper, and

Election of the Ireby Shopkeeper by Ballot.

their respective merits were discussed at a meeting called on the following Saturday. Four of these withdrew at this meeting, and another candidate was added, making eight now in the field. Meantime Mr. Lawson had declared that the election would be by ballot, and the suffrage universal. Brisk canvassing followed, between Saturday and the following Monday; when the vote was taken in a crowded meeting, made up to a great extent of people who had come only to see; as the total poll numbered only 36. At the head of the poll was Mr. Johnston, already a very successful shopkeeper, with the largest business in Ireby. Mr. Lawson found, however, that he could not get him to work at a cheap enough rate, and accordingly the next on the list was appointed.

Before July was out, about £80 worth of goods had been purchased; and by the end of the year the sales had amounted to £150; and the stock being valued at £75, a profit of £4 was declared. This, under Mr. Lawson's co-operative system of that year, could not go as a dividend on purchases; but went with the general business profits; all of which over $2\frac{1}{2}$ per cent. (for interest) were to be spent on public uses. Some grumbling followed when the profit was declared, and none of it went as a bonus to purchasers. Next year the business was pushed largely, the butter trade being gone into; but the result was unfavourable, showing a loss of £52. This doomed the whole shop trade; which, except in Blennerhasset, was soon balanced up and concluded. The detailed balance-sheet of Ireby is given below:—

IREBY SHOP.

| DR. | BALANCE-SHEET FROM 1868 TO 1869. | | | | | | CR. | |
|--------------------------|----------------------------------|----|---------------|------------------------|-------|----|-----|---------------|
| To Goods Purchased, £401 | 7 | 3 | $\frac{3}{4}$ | By Sales, . . . | £338 | 9 | 8 | $\frac{1}{4}$ |
| „ Wages, | 22 | 16 | 8 | „ Goods transferred | | | | |
| „ Railway Carriage, . . | 1 | 6 | 5 | to Blennerhasset | | | | |
| „ License, | 0 | 7 | 9 | Shop, | 40 | 18 | 0 | $\frac{1}{2}$ |
| „ General Account, . . | 2 | 0 | 9 | „ Balance, being Loss, | 48 | 11 | 2 | $\frac{1}{2}$ |
| | <hr/> | | | | <hr/> | | | |
| | £427 | 18 | 11 | | £427 | 18 | 11 | |

XV. COTTAGE PROPERTY.—When Mr. Lawson built the new farm-steading, all the out-buildings of the original stead-

The Cost of our Cottages.

ing became unoccupied; and, as most of these buildings faced the main road through Blennerhasset village, it was resolved to make some of them into cottages.

The first lot, when finished, was speedily inhabited, and, in consequence, we built many more; a few, new from the foundation, but the great majority out of the old stables, byres, and barns. Some of these were built as late as 1870; and as the old buildings were never separately valued, it is difficult to give a statement of the worth of this property for each year. The subjoined statement, however, gives the valuations adopted, and the amount expended in building each year. Both these items are given for 1865 and onwards; but rents, &c., only after 1867, when this account was separated from that of Land and Buildings.

COTTAGE PROPERTY ACCOUNTS.

| | 1865. | 1866. | 1867. | 1868. | 1869. | 1870. | 1871. | 1872. |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | £ | £ | £ | £ | £ | £ | £ | £ |
| Estimated Value, . | 1159 | 1934 | 1958 | 2440 | 2871 | 2922 | 2749 | 2900 |
| Building and Repairs, . | 240 | 794 | 24 | 605 | 135 | 105 | 48 | 1 |
| General Account, . | .. | .. | .. | 4 | 14 | 18 | 13 | 5 |
| Rents, . . . | .. | .. | .. | 99 | 148 | 177 | 306 | 40 |
| Sundries, . . . | .. | .. | .. | 7 | .. | .. | .. | .. |
| Loss, . . . | .. | .. | .. | 51 | .. | .. | .. | .. |
| Profit, . . . | .. | .. | .. | .. | 117 | 87 | 4 | 33 |

It is probable, from the amount of the first-given valuation, and the building expenditure of that year, that about £900 was the estimated value of the old farm buildings thus utilised.

In the above statement, the profit of 1871 stands at only £4, but it was in reality, £124. The difference is due to a reduction of the valuation by £120; the necessity for which reduction, arose from the high figure at which they were first valued in 1868.

Only five cottages were built new from the foundations; and four of these, the west-end cottages, as they were called, may serve as a sample of the cost of our cottages. They were built in 1866 in one row; and contained three rooms and a kitchen, all of fair size and finish. The cost in 1866 was £475, or £118 15s. each; but out-houses were afterwards added, so that by 1870 they averaged £132 7s.

The Baptism of "Tullochgorum Row."

each. These cottages were always in good demand; and 2s. 6d. per week was generally obtained for them; a return equalling almost exactly 5 per cent.

The rentals of the cottages varied from 1s. 6d. per week for the smallest, to 2s., 2s. 2d., and, once or twice, 2s. 6d., for those of three rooms and a kitchen. But the best year—1871—did not yield a clear profit of $4\frac{1}{4}$ per cent. on the estimated capital.

Cottage gardens were at first prohibited: but about 1868 the weekly parliament passed a resolution in their favour; and Mr. Lawson assenting, a field was divided off into plots of about 300 square yards. These were let to the cottagers for 6s. 4d. each, annually.

The naming of the cottage rows was a difficult business. At first, indeed, they were left unnamed; but one row being baptised "Tullochgorum Row" by one of our chief critics, with some disparaging remarks, the name was adopted, and the others were soon afterwards named too;—some from the name of a previous proprietor or tenant, some from their position, and one row after the controlling agent, in whose reign they were built. But of Tullochgorum Row more remains to be told. The author of the name was, at the time of its baptism, comfortably housed in a nice cottage, a little way out of the village; and as chief of "the opposition," he frequently and severely criticised our system of cottage letting, and declared that he would on no account ever become a tenant of Mr. Lawson's. But circumstances compelled him to vacate his nice cottage, and no other place being convenient, he was glad to take a house in Tullochgorum Row.

Cottage property stands as one of the four paying departments, out of the seventeen into which, for convenience, we sub-divided the business or rather businesses. The balance-sheet given below is for only four years; during which a profit was realised of £189, or less than 2 per cent. per annum. But to get at what the cottages really paid, 1868 should be omitted, as it was only a nine months' financial year; and the separation of the accounts was not then as perfect as afterwards. The reduction of valuation in

The American Investments.

1871 should also be omitted as due to earlier causes. Excluding also as unfairly favourable, the £33 of profit made in 1872, we find that the three years, 1869-70-71, made a clear profit of £329, on an annual valuation of £2,847, or about £3 19s. per cent. per annum. The gross rental (including 1868) averaged £7 2s. 8d. per cent.; so that four or five per cent. net should be easily obtained on such cottage property.

COTTAGE PROPERTY.

| DR. | BALANCE-SHEET FROM 1868 TO 1872. | CR. |
|---|----------------------------------|--|
| To value of Property in 1868 (from Land and Buildings Account), | £2,440 0 0 | By Rents, . . . £770 6 0½ |
| „ Repairs and Renewals, . . . | 872 12 3 | „ Sundries, . . . 6 14 1 |
| „ General Account, . . . | 53 16 6 | „ Value of Property in 1872 (to Land and Buildings Account), . . . |
| „ Reduction of Valuation in 1871, . . . | 120 13 2 | 2,900 0 0 |
| „ Balance, being Profit, . . . | 189 18 2½ | |
| | £3,677 0 1½ | £3,677 0 1½ |

XVI. THE AMERICAN INVESTMENTS department is *the profitable one*. Its commencement and purpose has been already explained in a previous chapter in connection with the auction mortgage. The balance sheet shows a profit of £1,169; though there were heavy expenses in starting it, mortgaging the estate, &c.

AMERICAN INVESTMENTS.

| DR. | BALANCE SHEET FROM 1869 TO 1872. | CR. |
|-----------------------------------|----------------------------------|--|
| To Investments, . . . | £25,658 5 0 | By Interest, . . . £768 14 7 |
| „ Commission, . . . | 42 19 4 | „ Amount withdrawn to Private Account, . . . |
| „ Cost of Mortgage in 1870, . . . | 286 13 4 | 5,412 4 11 |
| „ Legal Expenses, . . . | 14 10 1 | „ Stock (representing value of present Investments), |
| „ Interest, . . . | 10 10 3 | 21,095 19 2 |
| „ Income Tax, . . . | 9 19 0 | |
| „ American Agent, . . . | 78 0 0 | |
| „ General Account, . . . | 6 8 6 | |
| „ Balance, being Profit, . . . | 1,169 13 2 | |
| | £27,276 18 8 | £27,276 18 8 |

Criticisms sought from Nine Neighbours.

CHAPTER XIII.

WHAT OUR NEIGHBOURS THOUGHT OF US.

[As we had no objection "to see ourselves as others saw us," and, indeed, were willing to believe that a knowledge of the impression our proceedings made upon others, might be instructive to us; we asked many of our old critics and opponents to give us this information on their part. But we found most of them unwilling; and indeed but three letters were the total result of nine invitations. At one time we had in view to give in detail an exact and more minute history of our doings and sayings. This it has been found undesirable to attempt, chiefly because of the immensity of the task, and the "blue-book style" of the probable result. We have, however, given more of our practical farming facts than was then intended.

The following letters, though brief, will at least serve to show both sides of many features of our proceedings, and help thoughtful readers, to a juster estimate, both of our deeds and of our difficulties.

The first letter is from Mr. Lawson's first farm bailiff, who left in the autumn of 1866. The second is from his third Blennerhasset bailiff, between February, 1868, and the sale of the estate; and who had previously been farm bailiff at Prior Hall for three years. The third received was from a neighbouring tenant farmer; but being to the same effect, and going over much the same ground as the other two, it is omitted.

C. D. H.]

LETTER I.*

"In reply to your note requesting my opinion on Mr. Lawson's Co-operative and Farming experiments on his Blennerhasset and Prior Hall estates, I must say that I feel

* These Letters were addressed to Mr. Hunter.

Uselessness of the Councils and Meetings.

it to be rather a delicate undertaking. However, as I hold that no man's opinion is of much value who is afraid to express it, I shall give mine in my own way, conscious that not only shall I oppose the views of Mr. Lawson himself, but also those of a great number of so-called scientific farmers.

"First, then, as regards Co-operation. I must confess I could never understand how that could be called co-operation, where all the capital was invested by the proprietor. But then you tell me, 'Labour is Capital.' I grant this; but the question forces itself upon me—How much extra labour was executed by each individual operative upon the farm, over and above the quantity daily stipulated for? If none was expected or none yielded, there was no two-sided co-operation.

"It was always urged, 'brain work is superior to manual labour.' Undoubtedly. But, I ask, was all the advice tendered, the plans proposed, the arguments resorted to, the suggestions thrown out; in a word, do the results prove that all the brain power employed at the weekly meetings held for years, led to any practical money result? In my view, no. I am aware that a wise man has said, 'In the multitude of counsellors there is wisdom;' but after all much depends upon whether the counsellors are competent for their office.*

"For instance, here was a motley mixture of boys, girls, women, and men; of all trades and no trade or profession; indiscriminately drawn together into a council chamber, for the purpose of discussing and deciding upon the most important subjects regarding farming operations; though eight-tenths of them were quite ignorant and inexperienced regarding farming operations. I ask, how do they act? It may be a question of thousands of pounds—no matter to them; what do they care?—they have nothing invested, therefore

* (The writer of the omitted letter mentioned puts this observation in this form—"Solomon says, 'in the multitude of counsellors there is safety,' but this maxim does not hold good on a model farm." Solomon, who followed more attractive pursuits than farming, probably never expected that his maxim would be applied to agriculture.)—G. J. H.

Wherein Mr. Lawson began Well.

can lose nothing. I ask again, how do they act? Just as they are carried away by the prejudice or excitement of the moment. The vote of the meeting is taken, and of course the vote of the most ignorant and inexperienced counts equally with that of the wisest and most judicious man in the assembly. In this alone I can see sufficient cause for failure. Had Mr. Lawson secured an intelligent practical agriculturist, who would have gone in with him for high farming; and been guided by his advice, he would have saved not only the yearly bonus, but much, very much money which was voted away besides, without *any* return in the working of the co-operative system at Blennerhasset.

"Second, as to the farming. There are many things which, in my view, were sure to lead to failure in the end; but I will only name a few: and before I do this, allow me to say Mr. Lawson in many instances went the right way to work; for instance, in thoroughly draining and liming all the land, taking down all the old broad earth fences, clearing his land of boulders and trees, manufacturing artificial manures, putting in good roads all through his farms, buying up the best Shorthorn (though not pedigree) cattle, near calving or newly calved, and as soon as they began to milk, feeding them for the butcher; also selling all his new milk to hucksters, and feeding the young stock for the shambles from the time they were calved. All these things showed, to my mind at least, that by patient perseverance the farm would have paid well; but getting too many irons in the fire all at once, spoiled the welding heat.

"It was a great mistake getting the steam plough and grubber too soon; yes, years too soon. All the land ought to have been drained and levelled, every boulder taken out; every large tree root completely stubbed up; and good metal roads made all through the farm, before ever one puff of steam was raised at 'Mechi.' During the first years of the steam plough she tried to do her work, but the expenditure in men and boys' wages, horse labour, coals, oil, breakages, and STOPPAGES (which were not merely of daily, but almost hourly occurrence), must have been very great. This, to a great extent, would have been saved, had all been fitly prepared

Mistakes with Irrigation, Water-power, and Cattle.

for her coming. Steam cultivation is proving itself to be the right thing everywhere, but only after the land is properly laid out for it, will it pay at all.

“Another mistake was irrigation from manure tanks. The loss here was not merely in the machinery and fittings for applying the liquid, but also through laying valuable cattle on open wooden flooring (in order to convert all the dung into liquid), where so many valuable animals were sacrificed. Counting, then, the money value of the cows and calves, the force pump, tanks, pipes, hose, labour, turbine wheel, pit, head-race and tail-race, &c., in connection with this concern, we find it a complete loss; for a very little best Peruvian guano and nitrate of soda, with a mixture of home-made bone manure, would have produced after every mowing plenty of Italian grass, and saved all the outlay above described.

“I am of opinion that a small steam-engine would have done all the thrashing, grinding, pulping, straw and hay cutting, and saved all that the turbine wheel and water courses cost. The sheep-shed, *to a farmer*, was a dead loss; for it is abundantly proved that sheep do best in the open field.

“Another mistake, in my opinion, was giving up feeding *cattle, sheep*, and pigs. The plan at first adopted by Mr. Lawson showed he had got the right idea, had he patiently stuck to it, viz., milking and feeding for fat, &c. But by discontinuing to keep stock, he robbed the land of the very best material (a good muck midden) for producing crops of the very best feeding *quality*; for, had *good farmyard dung* been used, along with artificial manures of *his own manufacture, strength* and *stimulant* would have been combined; so that on such splendid cropping land as the estates at Blennerhasset and Prior Hall, the yield and quality would have been such as to warrant the keeping of a *numerous stock*, which, at the good selling prices since prevalent, would have yielded sufficient profit.

“Another mistake was the attempt to make all the land on both estates into a garden and nursery. Here there was such a diversity of departments, involving so much horse and

Letter from the Prior Hall Bailiff.

hand labour; and of necessity causing to be employed a whole host of gaffers, clerks, managers, and foremen, that these alone would devour the rent of any ordinary farm.

“These, then, are some of the things which, in my opinion, proved disadvantageous both to co-operation and farming on the Blennerhasset estate. No doubt, Mr. Lawson has this consolation, that by his endeavour to carry out this scheme, he has blessed many scores of his poorer fellow-creatures.

THOMAS BELL.”

LETTER II.

“I entered the service of William Lawson in January, 1865; and about the middle of February we commenced agricultural operations on the Prior Hall farm, which measured 146 acres, in eight or nine small fields. Mr. Lawson made particular inquiries as to what I thought about the farm, and its value per acre; and after I gave him my opinion, he asked if I could make it pay. I said I could, if he was not too fanciful, as many young gentlemen were.

“We soon commenced to lead lime and pull out fences; and in a short time had the farm arranged in three large fields, so as to be suitable for steam cultivation, which we tried with great success.

“Prior Hall is a farm suitable in all respects for steam cultivation. Its soil is strong and loamy, with a good subsoil; and land suitable for all ordinary kinds of crops, such as wheat, oats, cabbages, hay, leeks, Swede turnips; and in fact every kind of crop except onions: but most of it required draining for the finer crops, which we intended to grow.

“The second year we commenced to drain, and made a thorough job of it, laying most of the drains five feet deep; and a large amount of money was expended on draining, making roads, and taking out fences.

“An engine was quite a new thing so near the Binsey Hill, and it attracted many ladies and gentlemen from the neighbourhood, who all admired our farming operations.

“The three years Mr. Lawson had Prior Hall, he was almost always successful in raising fine crops; the only failure

Onions and Leeks as Farm Crops.

we had being six acres of onions, which were sown in good time, and came away well, until drought came when they all failed: but as we were determined to grow good onions, the crop being in general a profitable one, we made a second attempt on the same land; but again failed. We had good crops of turnips on the same ground both seasons; but I would not recommend any one to sow large fields of onions so far up the hills, as we did. We had also two acres of leeks, which were the best crop I ever saw; the land being well adapted for them: but the difficulty was to find a market. Our crop finally found a purchaser at £1 10s. an acre, but even at this figure he found them unsaleable.

"I can recommend cabbages as a profitable crop, and good for feeding lambs as early as August; which we did with great success. We also grew flax, and had capital crops, but failed to manufacture it successfully. The greater part of the farm was top-dressed with half-inch bones, at the rate of a ton per acre; and as we wintered a good head of sheep and cattle, at the end of three years the farm was in a high state of cultivation, and quite ready to repay Mr. Lawson his outlay on it. As he was bent on farming, we got possession of Newbiggen and Parkhouse, two neighbouring farms; and as soon as the crops were off the ground we commenced to cultivate these farms by steam power, as we had previously done Prior Hall.

"On August 1st, 1867, I left the farm to visit Paris, Mr. Lawson having been there for a considerable time. It was the year of the Great Exhibition, when I saw all the places of interest in and around Paris. We also went over the Emperor's Home Farm. Mr. Lawson directed me, on my return to England, to go to Aldershot and see Mr. Blackburn's farm; and also to Tiptree to Alderman Mechi's. I was there to learn all I could and turn it to account at home. Alderman Mechi was very kind, and showed me everything that could interest me on the farm. I asked him how his cattle did so well standing on the boards, as Mr. Lawson had not been fortunate when he did so with his; but he explained, that as he reared all his young stock on boards, they were accustomed to them, whereas Mr. Lawson had

Blennerhasset Farm unsuitable for Irrigation.

bought stock reared by others, which accounted for the difference.

“Mr. Blackburn’s manager showed me his mode of irrigation; and as the land was a sandy soil and very suitable for it, the liquid remaining near the surface, it grew very fine potato and hay crops. I was much interested in his irrigation scheme, as we had commenced it at Prior Hall with very good results, having cut Italian ryegrass early in May, weighing above 220 stones per acre; but I am thoroughly convinced now that land, to be suitable for irrigation, must be either very sandy or heavy, and with a good subsoil.

“Blennerhasset farm lies in a good position, near the railway, and is quite a model one, having been made almost anew by Mr. Lawson, who thoroughly drained it and cultivated it well, by means of two powerful steam-engines. I was four years with him on this farm, carrying out his orders; and, save for some mistakes, which might have been avoided, the result might have encouraged him to be a farmer yet.

“The farm, I think, is not suitable for irrigation, the soil being so sharp and gravelly that it cannot hold the liquid, which speedily finds its way down the drains. This is one mistake we afterwards made on the Blennerhasset Farm; about a mile of pipes being laid through different parts of the farm, and connected with tanks; there being only four acres of moss which could be irrigated with good result. I am confident that, from what I saw at Aldershott, and my experience of irrigation on the Prior Hall Farm, this is a correct conclusion with respect to irrigation on the Blennerhasset Farm.

“Mr. Lawson, I am certain, would have lost nothing by all his improvements on these estates, as the present rents at which the farms are let, would have paid him well, had he kept them.

“One mistake, as I have indicated, was making liquid manure tanks, and laying about a mile of pipes through the farm. Another was made in purchasing old cattle and tying them up on boards; leading to great loss, as all such cattle should have been *reared* on boards. Making flax tanks at a

The Councils and Meetings.

great expense, which were rarely used, was a mistake ; as also was putting up too many buildings for the acreage. These four mistakes, as I think, would cost Mr. Lawson above £8000 ; and after putting them all in order, they were laid aside or neglected.

“Our chemist attended to the manufacture of the manures, which were good and genuine ; but the nature of the soil, and continual cropping, all combined against them, as did also the want of farm-yard manure.

“Mr. Lawson, rich as he was, and surrounded with a multitude of counsellors ; and although he did nothing rashly, yet anything which was strange or out of the ordinary way, he took delight in, and did not believe sufficiently in what he called old-fashioned farming. Had Mr. Lawson commenced on good strong clay land, he would have been able to carry out his intention of farming without cattle. I was bound to apply a certain quantity of manures ; which was a difficult task, as it is risky to force wheat or corn, and you are sure to get too much straw. Had his chemical been assisted with farm-yard manures, “Cain” and “Abel” would have had some credit, as they did their parts well.

“Mr. Lawson, by building and rebuilding, much improved Blennerhasset village. He also took great interest in the welfare and education of those in the village and neighbourhood ; and commenced a series of Tuesday evening public meetings, which were well attended by farmers, ministers, and the public. I have sometimes even seen gentlemen from London, Liverpool, and Carlisle attend them ; and I have heard many useful subjects discussed there. These meetings were very entertaining, as the working-classes attended, and brought forward—as any one had liberty to do—subjects for discussion. Many young men are indebted to these meetings for much of the knowledge they possess ; as the balance-sheets and matters of importance connected with the farm or of public interest were there discussed.

“Mr. Lawson’s views on co-operation, I think, are good and sound, and he has taken great interest in this movement, delivering many lectures on the subject. He would have done striking good had he fully carried out the branches

The Main Cause of Mr. Lawson's Non-Success.

entered upon ; but as soon as any new scheme was got into working order, it was laid aside ; and, in my opinion, this was the main cause of Mr. Lawson's non-success. Mr. Lawson co-operated with his workers very successfully, all his offers to them being highly appreciated and well wrought for ; and the workers were just beginning to have full confidence in their employer, when the establishment was broken up. The class of workers on the farm were quite a superior body, and well worthy of co-operating with.

“GEORGE GLASSBROOK.”

Visit to Paris.

CHAPTER XIV.

THE FRENCH EXCURSION.*

THE successful application of the sewage of towns, for the purpose of promoting the growth of many crops grown by the farmer, is an admitted fact, and Mr. William Lawson was early impressed with the advantages attainable by the adoption of irrigation on the Blennerhasset Farm. The most noted sewage farms of the day were visited by him, as he has stated, and the various systems of application studied; while no expense was spared, to make the Blennerhasset Farm Sewage Works as perfect as any that had preceded them. Steam and water-power were both applied, while the arrangements for collecting the liquid manure from the farm steading were all that could be desired. The results, however, were anything but satisfactory; yet whether from misapplication, unsuitableness of sewage, or soil, or all combined, was never, I think, determined.

Mr. Lawson's non-success did not, however, destroy his faith in the principle; for, on visiting him at Paris in October, 1867, I found him advocating irrigation as the *sine qua non* of future farming. He had spent much of the summer in Paris, examining its wonderful exhibition. From the Blennerhasset Farm and district, batch after batch of travellers had, by his generous aid and assistance, enjoyed the same advantage.

* The excursion here recounted was mainly undertaken with a view of supplementing, if not of superseding, the Blennerhasset Model Farm. As the expenses of the journey appear in the balance-sheet, some particulars of the expedition will be relevant. Being written by a practical farmer, the comparisons of French and English agriculture in it are instructive; and the impressions of French life and manners made on visitors to the Exhibition in Paris, illustrate the advantages of those visits which Mr. Lawson generously afforded to his neighbours and workers.—G. J. H.

Proposed Irrigation Farm in France.

During Mr. Lawson's loiterings in Paris, he became acquainted with two 'cute, clever Frenchmen ; of a class we have no lack of in England ; who have no faith in hand work, but who depend more on brain than on bone and sinew for a livelihood ; they had evidently a good knowledge of men and things, and seemed to be no novices in the art of adapting the principles of irrigation to the soil.

One of them, a lithe, active young man of some 35 to 40 summers, by far the cleverer of the two, and evidently the prime mover in the affair to be investigated, had discovered a plot of land somewhere in the heart of France, most suitably situated for irrigation purposes ; sloping gently from outside to middle, from top to bottom, with a sluggish river, available for every purpose of irrigating the land and driving the required machinery. It seemed, by all accounts, to be a case worth looking into ; and, if found equal to representation, a desirable investment, and a property ready formed by nature for a superior model farm. Plans and specifications were prepared, and the whole process of buying, draining, building model farm buildings, breaking up, liming, cropping, irrigating, securing crop, and marketing, were discussed. Arrangements were made in due time for visiting the place, the services of an eminent agricultural engineer were secured, I was invited to accompany the expedition ; and, on the 12th of October, 1867, accompanied by the two Frenchmen, we set out to visit this desirable estate of 800 acres.

Co-operation was to be the basis of management, and this perhaps in the true sense of the term ; Mr. Lawson to find money, the two Frenchmen the controlling agency. Cain and Abel were to be exported ; and I am inclined to think the steam-plough managers would have winced somewhat under the new directorship,—for the Frenchmen were in a few years to become joint proprietors of the estate with Mr. Lawson.

We leave Paris, then, by train. Scenes ever new, curious, and interesting, crop up continually. Now a nice, tidy, well-cultivated little farm, with its flock of ewes and newly-dropt lambs ; then a division and sub-division of the land into such

Drawbacks to Good Farming in France.

an infinity of small, badly-managed plots, with no fences for miles, that the wonder to me is how everyone knows his own. This system of cutting up the land, so prevalent in France, is far from being a satisfactory one. With all our disadvantages of soil and climate, laws of primogeniture and entail, and increasing tendency towards larger holdings, statisticians tell us that the British Isles produce more food for animals than the entire surface of France, though of double the extent. If the comparison is made with England alone, the results are more striking still; for, taking all the products, animal and vegetable, into account, we find England, one-fourth the size of France, producing nearly double the amount. Owing to the cultivators of the soil in France being gathered into villages, often far apart; the occupation of the land being bad, and the small plots often far away from the steading; the deficient means of the cottiers often prevent them from obtaining the necessary implements for proper cultivation; whilst the many improvements carried on in the towns and cities, and the enormous standing armies always kept up, require such hordes of the most stalwart of the population, that labour is even more difficult of attainment than in England, and taxes are very materially augmented. Want of fences necessitates continuous ploughing, and requires the removal of all crops; want of roads often requires the removal of crops and addition of manure to be carried on by hand-labour; and while they seem to depend almost exclusively on the production of corn crops, without sufficiently considering the exhausting process of such continuous cropping, need we wonder at the deficient production?

In passing over a bleak, barren, and, to all appearances, uninhabited moor, some 50 or 60 miles from Paris, and still about 100 miles from our destination, our French friends tell us it is the district whence we are to expect our best customers for produce. We look out of the carriage window in vain for any signs of life; but are told that the white rock we see jutting out here and there is the French burr, and that in the immediate neighbourhood are immense quarries, where the French burr millstones are

How to make a smooth Macadamised Road.

manufactured, employing many hands, and causing much traffic. Although the district is very deficient in food-producing capabilities, it was hard not to be sceptical as to the inhabitants going upwards of 100 miles to buy either Italian rye grass or mammoth mangolds.

The aspect of the country is generally level, tame, and monotonous; but in passing along the Vale of the Marne we had occasional glimpses of hill, dale, and varied prospects. Along the sunny slopes were dotted pretty-looking whitewashed villages, with extensive vineyards, stretching far as the eye could reach; and although the grape-gathering season was far advanced, we had one opportunity of seeing a wine-press at work. We were informed that, notwithstanding the many improvements in the mechanical arts, the French generally—nay almost universally—preferred the old-fashioned mode of treading out the juice with the feet, and that it was very rare to find machinery used for the purpose.

After a ride of considerably over a 100 miles by rail, we passed the night at a considerable fortified town, surrounded by a moat, and which was entered only by a drawbridge, guarded by soldiers.

We hired a cabriolet and pair for the rest of the journey. The road was a good one—what in England we would call turnpike, and which in France is made by Government;—and here, I think, our highway boards might take a lesson to advantage from the French system; for instead of patching a little here and a little there, they cover the whole road well with nicely broken metal, pass a ponderous self-propelling steam roller a few times back and forward; and a good firm, durable, and smooth road, capable of enduring years of hard work, is the result.

About two o'clock P.M. we reached the house of a small cottier, where we were to dine. The place was not one of the most inviting; it was, in fact, a mud hovel. Vines, apples, pears, and other fruits, were very plentiful about the neighbourhood; and, being only two miles from our "Land of Goshen," visions of luscious fruits rose up in our imagination. In the course of a stroll I discovered the river we were to irrigate with; and if the tall reeds and rank

The Proposed Site.

grasses growing in its muddy bed were any criterion of its manorial fitness, it augured well for our success. I saw one of the most primitive and cumbersome ploughs I had ever seen, the drawing part resembling the front wheels and shafts of one of our wood waggons. A long beam was fixed to the axle, somewhat similarly to the pole of a waggon; a short, deep mould board and very short stilts, made up this apology for a plough; which was being used for ridging up wheat land in a very rough and unworkmanlike fashion. An old woman was herding some cattle and sheep on some meadow fog; and as the French generally show the utmost kindness to animals, they show no signs of fear. I caught one of the sheep, only to find its wool of the coarsest, and its bones nearly cutting its skin. The cows were rough, mongrel-bred ones, not superior to our low-class Irish.

The house where we dined got wonderfully tidied up, and we all partook of boiled eggs, grapes, pears, apples, nuts, and preserved cherries.

After dinner we set out for "the estate:" and after plodding on through mire and mud for some time, a short break in a large oak plantation brought us at once to the scene we sought for. And what a sight! Some 600 acres of water and 200 acres of mire and reeds! Frogs there were in thousands, and fishes, too, I have no doubt, in the water. But how unlike an "El Dorado" now, and what a transformation necessary ere the wished-for model farm appears! The site was really a beautiful one; the fine old oak plantations, completely surrounding it, gave it not only an imposing appearance, but afforded shelter, which the vines and other fruits would revel in. The soil and subsoil were considered all that could be wished, while the projected improvements and necessary buildings seemed to be all that was required to make it at once a most desirable model farm and a complete success. But where are the necessary labour and building materials? How much will buy up the several mills on our irrigating stream? Where are our markets for produce?—It is needless to inquire further;—for two days we worked out the problem in every conceivable way—we examined inlet and outlet—soil and subsoil—probability and improbability;—

French Cultivation.

yet the same result ever comes uppermost, the speculation is not feasible, and we pronounce accordingly. Mr. Lawson's office of interpreter was no sinecure, while the various plans and necessary operations, from purchase of property to sale of crop, were being overhauled.

Up to this time, our active French friend had laboured under a most severe cold; he had answered question after question until quite hoarse, his whole appearance indicating extreme suffering; yet, impelled on by hope, he bore up bravely against all difficulties, until, when our verdict went against him, nature gave way, and a more complete collapse I never saw; he was fairly wrecked. Since that time I have often felt thankful that this proposed "exportation" was never executed; for, when the Franco-German armies, three years after, ravaged the whole neighbourhood of the "swamp," the settlers might have found a market for their produce speedy enough, but far from satisfactory.

In this neighbourhood I saw the only solitary attempt at turnip culture. Observing at a distance some sort of crop growing that I could not make out, I proceeded to the place, and found it a miserable attempt to grow turnips. They were sown broadcast on the flat; and having cast in the seed, the owner had evidently thought Nature or Providence would do the rest, for they had evidently never been touched afterwards, the produce being nothing but tops and weeds. In the same field wheat sowing was going on quite extensively. Two ploughs were at work ridging up, each with four horses, one before the other, and a driver to each plough. Another party was busy setting out manure, with large unwieldy two-horse carts, something like the Blennerhasset Farm hay carts. A man at each end of the cart dragged out the manure, a driver attending to the horses. This gave one the idea that the farm must be an extensive one, with no scarcity of either horse or manual labour. I watched the proceedings for some time, and was satisfied that in England we could have put in a greater breadth of wheat in less time, with half the number of men and horses. The harrows were made wholly of wood, and their having wooden teeth implies light and porous soils.

French versus English Politeness.

In some parts they were busy lifting potatoes, the usual mode being to use drags similar to our manure drags;—quite a tedious process. Bullocks, ponies, and mules were used, as well as horses, for both ploughing and carting; two, three, or four being used, as the extent of the holding or the means of the occupier permitted; while many of the small cottiers were obliged to turn over their plots with a spade, a fork, or a drag. We saw the drag used one Sunday morning to turn over stubble somewhat dexterously.

The want of fences must be a great hindrance to farmers making the most of their land; for depasturing the land amid such an infinity of plots, with different owners, and under different crops, seems altogether out of question. The villages seem to have a sort of common right to grazing land, and jointly engage a herd to drive the cattle and pigs out in the morning, watch them during the day, and bring them in at night. During our journey we saw droves going out for the day; and lean, hungry, and miserable looking things they were. In some places, notwithstanding the lateness of the season, the farmers were at work with their after-maths or fog. Being unable to eat them where they grow, they mow them and make them into hay. Of course, the continuous cropping often causes a very poor return of fog, especially where the plots are small and badly cultivated.

The French people are praised for their politeness and civility, and I think truly; for I have always found them affable and kind: they often, at great trouble and much inconvenience to themselves, assisted me to find out places I was in quest of, an appeal to them for help never being made in vain. If I had difficulty in making myself understood, the bare mention of the word “Anglais” (English) was an “open sesame” to their “heart of hearts.” Some say it is more show than sympathy. I have no doubt strangers generally will prefer such “show” and attention to the sympathy of some of our London police. For instance, on our journey to Paris, as we were leaving Euston Square Station, London, we wished to find our way to Aldersgate; and meeting with a policeman, we civilly asked him where it was; to our great surprise we were gruffly informed that it was “whor it always was.” This

Street Manure of Paris.

may be a solitary instance of English incivility: but in France we had only to write down the name of the place wanted, draw a gendarme's attention to it, and he immediately did his best to point it out. Did he not know it, he would draw a book from his pocket, and, having found out the place, would indicate the nearest way to it.

In passing through the streets of Paris one day, my attention was drawn to a feature of sewage economy new to us, through the breaking of a cart-axle;—the cart being laden with a sort of manure known by the name of “poudrette,” and manufactured in some way from street sweepings and other refuse, and afterwards sold at so much per cubic foot. The market gardeners find it very useful for growing early potatoes and vegetables generally. The *Telegraph*, I find, states that, “during the last forty-five years, the yearly refuse of the streets of Paris has risen from £3,000 to £24,000, that being the sum the contractors pay for the street sweepings.” The estimate for scavenging the streets of Carlisle for 1867-8, I find is set down at £830, while the sale of manure is estimated only at £120. Of course the sewers remove much valuable matter, and, when properly applied to the Holme lands below the town, do much good.

On my return from Paris, I visited Mr. Blackburn's camp farm near Aldershot; here I found a plot of Italian ryegrass let for £24 per acre for the season, the said land two years before not being worth twenty-four pence per acre.

While in Paris I had many opportunities of seeing that the lower classes were very much dissatisfied with the Emperor. After the principal meal of the day, at six to eight o'clock p.m., we generally had some vocal music, the host as well as some other of the diners being excellent singers. On more than one occasion we had the “Marseillaise,” which had been suppressed by the Emperor. Before our host and his friends dared attempt to sing this hymn, the doors were all closed, and the hostess and servants set to watch that no gendarmes were near. It was then sung with a fervour most astonishing. When the subsequent revolution broke out, I found that I had been located right in the midst of the Communists.

Absence of Drunkenness and Squalor.

Seeing what an immense amount of poverty and wretchedness there is in all our large towns in England, I was much gratified to find so little appearance of it in Paris. In fact, the squalor and rags so common with us seemed wholly absent; the nearest approach to poverty I saw being a sort of nondescript rag and refuse gatherer, having a large basket or fruit hamper slung over his shoulders, and a short stick with a hook attached to the end of it in his hand. He went from dust heap to dust heap picking up all sorts of odds and ends, and throwing them dexterously over his shoulders into the basket. Another pleasant feature of Paris everyday life, was the absence of any appearance of drunkenness on the streets. Although I stayed at an hotel, visited a café at a late hour, attended a theatre, and was on the streets soon and late, yet I never once saw a drunken man during my stay. What a contrast this to any of our large towns! Well might the Frenchman say, it was well we were a drunken nation, or we might conquer the world. However, one sad phase of French life, to my mind, was, the great number of soldiers kept throughout France. Go where you would there they were, eating up the very substance of the nation.

In many other respects our visit to France was suggestive to us, and brought us advantages which spring from wider knowledge and means of comparison before unknown to us.

A NEIGHBOUR.

Costs and Returns of each Field and Crop.

CHAPTER XV.

VARIETIES OF FARM CROPPING—FARMING FACTS, OR
OUR CROPPING SHEETS.

IN 1868, careful accounts were kept of the cost and returns of each crop. All the hay, straw, grain, &c., used by the cattle and horses, were weighed and charged at current market rates. By this means a very fair idea was obtained of the relative profitableness of the various crops. After 1868, still more was attempted, and the accounts of each field were kept separate. The value of this will be evident, for no two fields were treated exactly alike; soils, too, differed, and the previous cropping and tillage. Those details thus furnish field experiments on a very large scale; and it is very interesting to study these large experiments, comparing the returns from two fields for the same year, and tracing the various causes of difference. If the reader will turn to the Wheat cropping sheet, No. 10, and glance at the returns for 1870, he will find one field showing £11 profit per acre, and another more than £2 loss. In the Potato cropping sheet, No. 8, he also will find for the same year a large field of $25\frac{1}{2}$ acres showing 5s. $4\frac{3}{4}$ d. loss per acre, and a neighbouring field of $15\frac{1}{4}$ acres showing nearly £3 per acre of profit. The causes of these differences it is interesting to analyse, and they are analysed as far as possible in the course of these chapters.

Each of these crops is taken up in the order indicated below, which is alphabetical, as nearly as the placing of two or more crops on one sheet would allow. It has been found necessary to divide the matter into two chapters. The second begins with the Oat cropping sheet, No. 7.

Actual Crop Profits and Losses of Three Years.

NO. 1. CROP PROFITS AND LOSSES FOR THREE YEARS ON THE
BLENNERHASSET FARM.

| No. of Sheet. | Kind of Crop. | 1868. | | 1869. | | 1870. | |
|---------------|------------------------|----------|---------|----------|---------|---------|---------|
| | | Profit. | Loss. | Profit. | Loss. | Profit. | Loss. |
| | | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| 2 | Barley, . . . | 4 5 7 | .. | 3 6 7 | .. | 5 1 10 | .. |
| 3 | Cabbages, . . . | .. | 1 7 11 | .. | .. | .. | .. |
| 3 | Carrots, . . . | 0 15 11 | .. | 0 15 4½ | .. | 8 11 11 | .. |
| 6 | Flax, . . . | 4 12 6 | .. | .. | .. | 1 5 1½ | .. |
| 4 | Italian Rye Grass, . . | .. | .. | 6 2 4½ | .. | .. | .. |
| 5 | Lea Hay, . . . | 5 9 11 | .. | 5 7 0½ | .. | 3 0 5½ | .. |
| 6 | Meadow Hay, . . | 6 15 4 | .. | 2 9 5½ | .. | .. | 0 18 9 |
| 3 | Mangold, . . . | 0 12 1 | .. | .. | .. | .. | 0 5 11 |
| 7 | Oats, . . . | 5 19 2 | .. | 4 11 11½ | .. | 4 6 2½ | .. |
| 2 | Oats (Canadian), . . | 4 11 3 | .. | 2 15 7½ | .. | .. | .. |
| 4 | Pasture Grass, . . | 2 12 4 | .. | 0 13 7½ | .. | .. | 1 7 9½ |
| 8 | Potatoes, . . . | .. | 2 8 9 | .. | 0 11 3 | 2 6 3 | .. |
| 9 | Swedes, . . . | .. | 5 12 8 | .. | 5 10 5½ | .. | 4 15 7½ |
| 10 | Wheat, . . . | 12 12 6½ | .. | 3 14 11¼ | .. | 3 4 9½ | .. |

The above figures show in many respects a striking contrast to the first made *estimates* of 1866 and 1867. The Cropping Sheets were at first intended as a basis, upon which a correct valuation of the land should be made; but the crop estimates by different persons varied so much, that we at last decided on keeping exact accounts of the *actual* expenditure and returns for each. These we have since found to be of much greater practical use than had been anticipated. They furnish many important hints on rotation, and on the best kinds of cultivation, manure, and seed, as regards both quantity and kind.

Some of the early estimates were very amusing. The gardeners gave always the best promise by far, their profit columns showing for young larches £67 per acre, for young thorns, £41; leeks, £76; onions, £66; carrots, £38; and Italian rye grass, £29. When, however, it was gravely proposed (!) to crop the whole farm with leeks and young larches, these promised profits were considerably modified.

In the following Sheets, the cost of cultivation has been obtained by charging the labour of each horse at

The Expenditure included in the Cropping Sheets.

3s. 9d. per day, or 7s. 6d. for a draught. This includes food, tear and wear of horse flesh and implements, and the joiner's, saddler's, and smith's bills. The actual cost, however, was lower by $8\frac{1}{2}$ d. a-day; as may be seen by reference to the subject of Horse Labour in the Index. Manual labour and steam cultivation are also included in the cultivation columns, being charged at cost price. Manure from the cattle was charged at 7s. 6d. a ton, and the chemical manure at the prices given in the chapter on Manures. The seed is at cost price, including railway carriage. There are a few other items of expenditure charged against the farm, and not included in the Cropping Sheets. These were as follows, given both per annum and per acre:—

FARM EXPENDITURE NOT CHARGED IN THE CROPPING SHEETS.

| | Per Annum. | Per Acre. |
|---|------------|-----------|
| Bailiff's and Clerks' Wages, Rates and Taxes, Stationery, Postage, &c., . . . | £150 10 0 | £0 9 11 |
| House Expenses, Travelling do., Coals, Gas, Servants' Board, &c., | 88 4 7 | 0 5 10 |
| Paint, Slates, Insurance, and Trips, | 11 17 9 | 0 0 9½ |
| Roads and Fences, | 25 16 11½ | 0 1 8½ |
| Sundries, | 17 17 11 | 0 1 2½ |
| Total, | £294 7 2½ | £0 19 5½ |

This means an expenditure on the whole Farm of nearly £300 per annum (about £1 per acre), not included in the Cropping Sheets. It is better, too, that they are not included, as most farmers do not incur many of them; the only common one being Rates and Taxes; which amounted with us to nearly 3s. 6d. per acre. The above extras, however, amounting to 19s. $5\frac{1}{4}$ d. per acre, are the average of the whole ten years, in the earlier part of which, only, was much of this expenditure incurred. Taking 1870 as our guide, we find it was only about 15s. 7d. per acre.

Rent, it will be noticed, has no place in the above table, nor has it in the Cropping Sheets. As has been shown, £2 an acre may be allowed for this. Nor has interest on farming capital been taken into account. Perhaps £10 an acre of capital, which gives an average all

Condition of Land and Previous Cropping.

through of £3,030 per annum, is at least on the safe side; and this, at 5 per cent., would give a further charge of 10s. per acre against our Cropping-Sheet profits.

Another point of evident importance left untouched in these Cropping Sheets is the after-condition of the land. This must vary greatly with different crops, and different quantities of manure and tillage; and probably hardly two farmers would estimate the value of these alike. An estimate has in general been made for each crop; but properly each field demands a separate valuation. Our attempts to deal with this question will be found detailed in the chapter on Manures. See also "Soil Exhaustion," in the Index.

Subject to these qualifications we offer our Cropping Sheets, as fairly reliable statements of the actual expenditure and returns of our farm crops; for three, and in some cases four, years. The fourth year's returns (1871) are those mainly of the auction sale; but only a few of the crops are given for 1871, of which Lea hay and Potatoes are the most important. The returns of the latter are especially valuable; as, any annual average for Potatoes would be misleading, which did not include the results of a year of disease; and 1871, in Cumberland at least, was notorious in respect of Potato disease.

Previous cropping having much to do with the results shown in these Cropping Sheets, it is necessary that, for the principal fields at any rate, a list of the annual cropping should be given. This is attempted on the next page, but has been a task of some difficulty; the want of proper account-books during the earlier years, being chiefly to blame for this. So that for 1864 the cropping is mainly guess work, and partially so for 1863, 1865, and 1866. At first, too, some of the larger fields were cropped in parts; but, for simplicity's sake, only the main crops are stated. The acreages are given roughly, some of the field boundaries not being constant; but subject generally to enlargement, as the uprooting of hedges, the purchase of Benson's estate, and latterly, a better system of farming, enabled us to arrange our land better.

Cropping of the Large Fields.

TABLE I.—CROPPING OF THE LARGE FIELDS.*

| Name of the Field. | Acre- age. | 1863. | 1864. | 1865. | 1866. | 1867. | 1868. | 1869. | 1870. | 1871. |
|--------------------|---------------|---------|-------|----------|----------|----------|----------|----------|----------|----------|
| Bore Hole . | 15 | .. | .. | Cabbages | Oats | Swedes | Barley | Hay | Potatoes | Wheat |
| East Heads . | 26 | Turnips | Oats | Turnips | Oats | Barley | Hay | Oats | Potatoes | Oats |
| Festival Field | 37 | .. | .. | Oats | Turnips | Oats | Turnips | Oats | Hay | Potatoes |
| Fitz Field, S. | 9 | .. | .. | Turnips | Oats | Potatoes | Oats | Hay | Oats | Potatoes |
| " " N. | 7 | .. | .. | Wheat | Turnips | Oats | Oats | Hay | Oats | Potatoes |
| Gillbushes . | 15 | Barley | Hay | Grass | Grass | Grass | Grass | Oats | Potatoes | Wheat |
| Gillgooden . | 23 | Grass | Grass | Grass | Turnips | Wheat | Hay | Wheat | Hay | Wheat |
| Longlands, E. | 14 | Swedes | Oats | Turnips | Oats | Barley | Potatoes | Oats | Oats | Potatoes |
| " " W. | 10 | .. | .. | Grass | Grass | Potatoes | Wheat | Hay | Oats | Potatoes |
| Mid Heads . | 17 | Turnips | Oats | Potatoes | Turnips | Oats | Hay | Potatoes | Wheat | Hay |
| Mire-Ings . | 25 | .. | .. | Grass | Oats | Swedes | Oats | Swedes | Oats | Hay |
| Moss . | 16 | Meadow | .. | Oats | Potatoes | Turnips | Oats | Hay | Oats | Potatoes |
| Nursery . | 11 | Oats | .. | Oats | Flax | Oats | Oats | Swedes | Oats | Hay |
| Wet-Flat, E. | 8 | .. | Grass | Grass | Grass | Grass | Oats | Swedes | Potatoes | Hay |
| " " C. | 6 | Oats | .. | Oats | Turnips | Barley | Wheat | Wheat | Wheat | Hay |
| " " W. | 10 | Wheat | .. | Cabbages | Oats | Turnips | Wheat | Hay | Wheat | Hay |
| West Heads . | 26 | Oats | .. | Potatoes | Wheat | Hay | Oats | Potatoes | Oats | Hay |

* See Frontispiece for plan of these fields.

Barley not much grown.

This Table presents considerable variety of rotation, or rather no rotation: a circumstance, as will be seen, very disadvantageous to the farm profits, though advantageous to the reader. For the greater the variety of the cropping, the more instructive should the results be. Some of the details are, indeed, amusing; but to any one engaged practically in farming, they will be found much more than that. The attention should be fixed on one of the irregularly cropped fields, and its results studied in the "Total Income" or "Profit" (or "Loss") columns. Of such fields the Nursery was one of the hardest cropped; and Longlands (East) and Wet-flat (Central) nearly as much. It must, however, be remembered that much of the irregular and seemingly random cropping of 1868 and 1869, was due to an attempt to bring many of the larger fields under one crop, and into a proper rotation. This was manifestly the intention on Longlands and on Wet-flats, as every part of these two fields shows the same crop in 1870.

With these explanations; and with Table I. ready to hand for reference, we may now consider the Cropping Returns; taking them in the order (chiefly alphabetical) indicated on page 222.

2. BARLEY, then, in this order, is given on pages 228-9. Our soil was well adapted for it, and the crop generally was fairly profitable; but it was not a favourite, and only on specially well adapted parts was it sown at all. Perhaps the only noteworthy point is the yield of only 9 imperial bushels per acre on the Head-race field, No. 2, in 1869. This field contained a gravel pit, and was quite an awkward corner; the cultivation and manure columns indicate also but little attention, and this, probably, was the main cause of the failure. The $8\frac{1}{2}$ acres of Festival field show a much better return; but, as a whole, the barley crop presents but little interest. The average profit shown per acre (No. 7) is £4 19s. $6\frac{1}{4}$ d.; but this should be lower comparatively, as the manure was trifling, and the exhaustion of soil appreciable. The manure used for this crop was the general corn manure; but the quantity applied was so slight, that the

Canadian Oats.

reduced condition of the land would be considerable, and might be reckoned at least at 20s. per acre, reducing the profit to £3 19s. 6d. The variety of barley sown was in general the chevalier, and the quality of the produce was fit for malting.

I think a safe, though rough and ready rule, is to charge the land, in a four-course rotation, as £3 per acre better after the root crop, and £1 an acre worse after each of the three following crops.* By this rule each course clears itself, and the Land does not, as I have often seen it in such estimates, show an impossible profit at the end of several rotations.

THE CANADIAN OAT crop is also included in Cropping Sheet No. 2. Of it, it may also be said as of barley, that it was grown only on picked soil, or in small corners. The average profit equalled £3 13s. 5d., which exhaustion of soil would reduce by £1 per acre. It thus shows £1 14s. per acre less profit than common potato oats.

OATS with seeds stands separated from the ordinary oats only in 1867. This crop is credited with 3s. 10d less profit per acre; but the land being valued £1 better because of the seeds, it stands 16s. 2d. beyond the ordinary oat crop. It is, however, more a question of convenience than profit, and we have no fairly comparable results on the question.

3. CARROTS, given on pages 232 and 233, is the next on the list. It was always a profitable crop, and paid well for manure; and it was not, like potatoes, liable to a disease that might rot half the crop. It was, however, as the bailiff said, a "petted" crop; and he had to choose its ground, and watch for good sowing weather. A peaty soil, or one of friable deep loam was always preferred: and we had few failures. In 1868 and 1869, both very dry springs, it almost refused to come; but the precaution of damped seed, mixed with wet sand, generally ensured some crop. The profit shown for 1867 is doubtful, but the others may be relied upon. The best of these is the 1870 crop, which shows £8 11s. 10½d. of profit per acre: the preceding crop had been oats after five years' lea.

No. 2.—BARLEY AND CANADIAN OATS, 1867-8-9 AND 1870.—OUTLAY PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Grubbing.* | Ploughing. | Harrowing. | Rolling. | Cultivation. | Seed. | Manure. | Harvesting. | Housing. | Threshing. | Delivery. | Total Outlay. | No. |
|-----|---------------------------------------|----------|------------|------------|------------|----------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|-------------------|--------------------|-----|
| 1 | Barley Crop— 1869, Festival Field. | 8½ | ... | 1 | 3 | 1 | ℓ s. d. 0 18 9 | ℓ s. d. 0 14 2½ | ℓ s. d. 0 11 11 | ℓ s. d. 0 11 9½ | ℓ s. d. 0 10 5½ | ℓ s. d. 0 9 9½ | ℓ s. d. 0 2 6½ | ℓ s. d. 4 18 6½ | 1 |
| 2 | " Head Race, | 1½ | ... | 1 | 2 | 1 | ℓ s. d. 0 15 3½ | ℓ s. d. 0 11 4 | ... | 0 4 2 | 0 3 10½ | 0 7 0½ | ... | 2 1 8 | 2 |
| 3 | Average of 1867, | 18 | ... | ... | ... | ... | ℓ s. d. 0 17 5 | ℓ s. d. 0 13 0 | 0 2 0 | 0 1 4 | ... | 0 0 0 | 0 1 6 | 5 15 11 | 3 |
| 4 | " 1868, | 6 | ... | ... | ... | ... | ℓ s. d. 0 18 5 | ℓ s. d. 0 17 6 | 0 13 0 | 0 16 8 | ... | 0 6 9 | ... | 5 2 4 | 4 |
| 5 | " 1869, | 10 | ... | ... | ... | ... | ℓ s. d. 0 18 2½ | ℓ s. d. 0 13 9½ | 0 6 4 | 0 10 7½ | 0 9 5½ | 0 9 4½ | 0 2 2 | 4 9 11 | 5 |
| 6 | " 1870, | 1½ | 1 | ... | 2 | 1 | ℓ s. d. 0 5 3 | ℓ s. d. 0 4 0 | ... | 0 16 9½ | 0 11 3 | 0 13 5½ | 0 1 7½ | 2 12 4½ | 6 |
| 7 | " 1867-70, | 35½ | ... | ... | ... | ... | ℓ s. d. 0 17 4 | ℓ s. d. 0 12 0½ | 0 10 1 | 0 17 0½ | 0 5 2 | 0 12 4½ | 0 1 4 | 4 10 1½ | 7 |
| 8 | Canadian Oats— 1868, W. Wet-flat, | 4 | ... | ... | ... | ... | ℓ s. d. 0 17 4½ | ℓ s. d. 0 10 1 | 0 17 1½ | 0 10 9½ | ... | 0 10 4 | ... | 4 15 7½ | 8 |
| 9 | 1869, Head Race, | 3½ | ... | 1 | 2 | 1 | ℓ s. d. 0 16 5½ | ℓ s. d. 0 17 1½ | ... | 0 15 5 | 0 10 8½ | 0 7 8 | 0 0 4½ | 3 7 9½ | 9 |
| 10 | Oats with Seeds— Average of 1867, | 21½ | ... | ... | ... | ... | ℓ s. d. 0 18 0 | ℓ s. d. 0 2 0 | 0 2 10 | 0 1 0 | ... | 0 12 0 | 0 1 6 | 7 1 6 | 10 |

* The figures in this and the three succeeding columns state the number of times Grubbed, &c.

No. 2.—BARLEY AND CANADIAN OATS, 1867-8-9, AND 1870.—RETURN AND PROFIT PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Good Corn. | | Hinder-ends. | | Straw. | | Total Return. | | Total Outlay. | | Profit. | |
|-----|---------------------------|----------|------------|---------|--------------|---------|--------|---------|---------------|---------|---------------|---------|---------|---------|
| | | | Bush | £ s. d. | Bush | £ s. d. | Stones | s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| 1 | Barley Crop— | | | | | | | | | | | | | |
| 2 | 1869, Festival Field, | 8½ | 34½ | 7 13 10 | ½ | 0 0 9½ | 107½ | 0 17 11 | 8 12 6½ | 4 18 6¾ | 3 13 11¾ | | | |
| 3 | " Head Race, . | 1½ | 9 | 1 16 8 | .. | .. | 104 | 1 10 4 | 3 7 0 | 2 1 8 | 1 5 4 | | | |
| 4 | Average of 1867, . | 18 | .. | .. | .. | .. | .. | .. | 13 0 0 | 5 15 11 | 7 4 1 | | | |
| 5 | " 1868, . | 6 | .. | .. | .. | .. | .. | .. | 9 7 10½ | 5 2 4 | 4 5 6½ | | | |
| 6 | " 1869, . | 10 | 30½ | 6 16 0½ | 0 | 0 8½ | 107 | 0 19 9½ | 7 16 6½ | 4 9 11 | 3 6 7¼ | | | |
| 7 | " 1870, . | 1½ | 29 | 6 4 9½ | .. | .. | 157 | 1 9 5 | 7 14 2½ | 2 12 4½ | 5 1 10 | | | |
| | " 1867-70, Canadian Oats— | 35½ | .. | .. | .. | .. | .. | .. | 9 9 7¾ | 4 10 1½ | 4 19 6½ | | | |
| 8 | 1868, W. Wet-flat, | 4 | .. | .. | .. | .. | .. | .. | 9 6 10½ | 4 15 7½ | 4 11 3 | | | |
| 9 | 1869, Head Race, | 3½ | 22 | 3 10 7 | .. | .. | 164 | 2 12 9½ | 6 3 4½ | 3 7 9½ | 2 15 7 | | | |
| 10 | Oats with Seeds— | | | | | | | | | | | | | |
| | Average of 1867, . | 21½ | .. | .. | .. | .. | .. | .. | 13 10 0 | 7 1 6 | 6 8 6 | | | |

Prices obtained for Carrots.

The manure was at the rate of nearly 22 cwts. per acre; it contained about 5 cwts. sulphate of ammonia, $4\frac{1}{2}$ cwts. of muriate of potash, and 11 cwts. of superphosphate. This crop, thus saddled with £25 per acre of expenses, leaves, however, nearly £9 after all expenses are paid; and, seeing that £7 worth of cultivation and £10 worth of manure were applied, surely £4 per acre, or less than one quarter of this expenditure, is not too much to allow for unexhausted manure and tillage. If this is allowed, carrots proved by far the most profitable crop, and come best up to our early cropping-sheet estimates.

At Prior Hall, this crop was also highly profitable; and on one occasion an amusing scene occurred at Wigton market; the Blennerhasset bailiff having offered a customer some carrots at about £2 10s. per ton, just a few minutes after this customer had purchased a quantity from the Prior Hall bailiff at £3 6s. 8d.

Even when sold by auction, as were the 8 acres of 1871, the price, although a low one, left the handsome profit of £6 8s. $1\frac{1}{2}$ d. per acre. Deep steam grubbing, and autumn manuring with farmyard manure, were under trial this year; and over 4 tons of potato manure had been also applied on part of the field; but the sale of the estate put a stop to any testing of the results.

The prices obtained for carrots varied from £2 to £3 6s. 8d. per ton, and the weight per acre from 5 to 18 tons. The acreage, however, was so small, that nothing reliable can be drawn from a study of the previous cropping. The variety sown was almost invariably the Long Red Altringham Carrot.

CABBAGES, also on Cropping Sheet No. 3, on pages 232 and 233, were largely grown in the cattle-feeding days; but no accounts were then kept of the yield. It was a very useful crop for sheep and lambs; but when the feeding of these was given up, we could not easily find sale for all we grew. Small lots were sold at about 9d. per dozen, or nearly 2s. per cwt.; but though Manchester, Liverpool, and Leeds were tried, we could not readily dispose of large lots; and this crop had to be given up in consequence. It was gen-

Experiments on the Cabbage Crop.

erally manured, half with farm-yard manure and half with artificial. The weight grown per acre was never tested except in the experiments; but facts on this point and on that of manure, are furnished by an amusing contest, which arose at one of the weekly parliaments in 1870. The bailiff who had grown prize cabbages at Prior Hall, held that they could not be grown without farm-yard manure. To this the chemist replied that they could; and forthwith a trial was arranged for, each party being unlimited as to quantity and cost of manure. The bailiff, however, afterwards wanted Peruvian guano with his manure; so his plot was divided into two, one half to have guano and the other half not. Four plots of four drills, each 28 inches wide and about 120 yards long, were manured as below, and the plants dibbled in, about a foot apart, on March 21. A part of the garden had been selected—more for convenience than utility, as it was rather stiff and cold for this crop. The season also was unfavourable. On Sept. 22nd, the gardener, in whose hands the experiment had been placed, took the first cutting, and on November 3rd the second. One fifty-sixth part of an acre from each plot was weighed as a test; the plants were also counted, and the results calculated per acre, the cabbages being valued at 1s. 6d. per cwt.

TABLE II.—EXPERIMENTS WITH DIFFERENT MANURES FOR CABBAGES.

| Manure per Acre. | | Cost of Manure. | Weight of the first Cutting. | Weight of both Cuttings. | Average Weight of 10 Cabbages. | Value of Crop less the Cost of Manure. |
|------------------|--|-----------------|------------------------------|--------------------------|--------------------------------|--|
| 1 | Potato Manure 10½ cwt. | £5 2 4 | 164 cwt. | 244 cwt. | 32½ lbs. | £13 3 8 |
| 2 | Cattle Manure, 21 tons | 7 17 6 | 146 " | 187 " | 26¾ " | 6 3 0 |
| 3 | Cabbage Manure 13 cwt. | 5 17 0 | 168½ " | 235 " | 35 " | 11 15 6 |
| 4 | Cattle Manure, 21 tons, and Peruvian Guano, 2 cwt. | 8 5 6 | 153½ " | 180½ " | 28¾ " | 5 5 3 |

Many plants, however, had burst; but these were counted, and, if valued at the average weights, bring up the dunged plots considerably. No. 1, then, becomes 251 cwt.; No. 2, 204½; No. 3, 247; and No. 4, 206 cwt. It is somewhat strange that the plot No. 4, with Peruvian guano additional,

No. 3.—CARROTS, MANGOLDS, AND CABBAGES.—OUTLAY PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Grubbing. | Ploughing. | Harrowing. | Rolling. | Crushing. | Cultiva- tion. | Seed. | Manure. | Harvest- ing. | Sorting. | Deliv- ery. | Whole Outlay. | No. |
|---------------|-------------------------|----------|-----------|------------|------------|----------|-----------|-------------------|--------------------------------|---------|------------------|----------|----------------|------------------|-----|
| Carrot Crop— | | | | | | | | | | | | | | | |
| 1 | 1867, Part Moss | 3½ | .. | .. | .. | .. | .. | £ s. d. £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | 1 |
| 2 | 1868, " Festival | 3½ | .. | .. | .. | .. | .. | 2 10 6 0 8 9 | 1 5 0 1 9 0 0 10 0 | .. | .. | .. | .. | 6 3 3 | 2 |
| 3 | 1869, " Mire-Ing. | 6½ | 3 | 2 | 7 | 1 | 2 | 1 16 3½ 0 13 3½ | 5 5 11 1 8 1½ | .. | 0 8 5½ | .. | 0 8 5½ | 9 12 1 | 3 |
| 4 | 1870, " Gillbushes | 1½ | .. | 1 | 2 | .. | 1 | 5 3 6 0 8 11½ | 4 18 7½ 2 13 2½ 0 3 10½ | 1 5 6½ | 14 13 8½ | .. | 14 13 8½ | 25 0 8½ | 4 |
| 5 | 1871, " Moss | 8 | 2 | .. | 4 | .. | .. | 7 8 2 0 9 10½ | 10 12 8½ 4 11 6 0 5 2½ 1 13 3½ | .. | .. | .. | 15 14 8 | 5 | |
| 6 | Average of 1868-71 | 19½ | .. | .. | .. | .. | .. | 5 0 10½ 0 13 3½ | 5 18 1½ | .. | .. | .. | .. | 16 5 3½ | 6 |
| Mangold Crop— | | | | | | | | | | | | | | | |
| 7 | 1868, Part Festival | 1 | .. | .. | .. | .. | .. | 4 17 2½ 0 11 4½ | 6 13 10½ | .. | .. | .. | .. | 12 12 6½ | 7 |
| 8 | 1870, " Gillbushes | 2 | .. | 1 | .. | .. | .. | 1 17 2 0 4 4½ | 7 1 2 1 12 8 1 1 3 0 15 10½ | .. | 1 3 0 15 10½ | .. | 12 12 6½ | 8 | |
| Cabbage Crop— | | | | | | | | | | | | | | | |
| 9 | 1867, Part Experiment | 2 | .. | .. | .. | .. | .. | 3 13 5½ 0 4 0 | 9 7 2½ 5 12 5 0 18 8½ 0 13 5½ | .. | 0 16 0 | .. | 12 16 9 | 9 | |
| 10 | 1868, " Festival, | 1 | .. | .. | .. | .. | .. | 3 10 9 2 10 0 | 5 0 0 1 0 0 | .. | 0 16 0 | .. | .. | 12 10 5½ | 10 |
| | | | | | | | | 1 5 9½ 1 6 8 | 8 0 0 1 18 0½ | .. | .. | .. | .. | 12 10 5½ | |

No. 3.—CARROTS, MANGOLDS, AND CABBAGES.—RETURN AND BALANCE PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Large Roots. | | Small Roots. | | Total Return. | | Total Outlay. | | Profit. | | Loss. |
|-----|---------------------------|------------------|-------------------|------------------------|------------------|----------------------|-----------------------|-----------------------|-----------------------|---------|---------|----|-------|
| | | | Cwt. | £ s. d. | Cwt. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | | |
| | Carrot Crop— | | | | | | | | | | | | |
| 1 | 1867, Part Moss, . | 3 $\frac{1}{4}$ | .. | .. | .. | .. | 25 0 0 | 6 3 3 | 18 16 9 | .. | .. | .. | .. |
| 2 | 1868, „ Festival Field, . | 3 $\frac{1}{2}$ | .. | .. | .. | .. | 10 8 0 $\frac{3}{4}$ | 9 12 1 | 0 15 11 $\frac{3}{4}$ | .. | .. | .. | .. |
| 3 | 1869, „ Mire-Ing, . | 6 $\frac{1}{2}$ | 100 | 14 16 9 | 5 $\frac{1}{4}$ | 0 12 4 $\frac{1}{2}$ | 15 9 1 $\frac{1}{2}$ | 14 13 8 $\frac{3}{4}$ | 0 15 4 $\frac{3}{4}$ | .. | .. | .. | .. |
| 4 | 1870, „ Gillbushes, . | 1 $\frac{1}{2}$ | 198 $\frac{1}{2}$ | 30 11 1 | 39 $\frac{3}{4}$ | 3 1 6 $\frac{1}{2}$ | 33 12 7 $\frac{1}{2}$ | 25 0 8 $\frac{3}{4}$ | 8 11 10 $\frac{3}{4}$ | .. | .. | .. | .. |
| 5 | 1871, „ Moss, . | 8 | .. | .. | .. | .. | 22 2 9 $\frac{1}{2}$ | 15 14 8 | 6 8 1 $\frac{1}{2}$ | .. | .. | .. | .. |
| 6 | Average of 1868-71, . | 19 $\frac{1}{4}$ | .. | .. | .. | .. | 20 8 1 $\frac{3}{4}$ | 5 3 $\frac{1}{2}$ | 4 2 10 $\frac{1}{4}$ | .. | .. | .. | .. |
| | Mangold Crop— | | | | | | | | | | | | |
| 7 | 1868, Part Festival, . | 1 | .. | .. | .. | .. | 13 4 7 $\frac{1}{2}$ | 12 12 6 $\frac{1}{4}$ | 0 12 1 $\frac{1}{4}$ | .. | .. | .. | .. |
| 8 | 1870, „ Gillbushes, . | 2 | 372 | 19 19 11 $\frac{3}{4}$ | 3 $\frac{1}{4}$ | 0 3 4 | 20 3 3 $\frac{3}{4}$ | 20 9 2 $\frac{1}{2}$ | .. | .. | .. | .. | .. |
| | Cabbage Crop— | | | | | | | | | | | | |
| 9 | 1867, Part Experiment, . | 2 | .. | .. | .. | .. | 16 0 0 | 12 16 9 | 3 3 3 | .. | .. | .. | .. |
| 10 | 1868, „ Festival Field, . | 1 | .. | .. | .. | .. | 11 2 7 | 12 10 5 $\frac{3}{4}$ | .. | .. | .. | .. | .. |
| 11 | Average of both, . | .. | .. | .. | .. | .. | 13 11 3 $\frac{1}{2}$ | 12 13 7 $\frac{1}{2}$ | 0 17 8 | .. | .. | .. | .. |

No. 4.—LIQUID-MANURED GRASS, PASTURAGE, &c.—PROFIT OR LOSS PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Dried Grass. | | Grass and Fog. | | Total Return. | | Total Outlay. | | Profit. | | Loss. | No. |
|-----|--------------------------|--------------------------------|---------------------------------|------------------------------------|------------------------------------|---------|-------------------------------------|------------------------------------|------------------------------------|---------|---------|---------|-------|-----|
| | | | Stones | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | | |
| 1 | Italian Rye-grass— | | ... | .. | .. | .. | 13 0 0 | 12 4 9 | 0 15 3 | .. | .. | .. | 1 | |
| 2 | 1867, Part Longlands | 4 ³ / ₄ | 191 | 4 15 5 ¹ / ₂ | 3 6 2 ¹ / ₂ | .. | 8 1 8 | 2 5 7 ³ / ₄ | 5 16 0 ¹ / ₄ | .. | .. | .. | 2 | |
| 3 | 1869, " Moss | 3 ³ / ₄ | 371 ¹ / ₂ | 9 5 9 ¹ / ₄ | 1 5 5 ³ / ₄ | .. | 10 11 3 | 3 8 6 7 | 2 2 9 | .. | .. | .. | 3 | |
| 4 | " " Longlands | 1 | 233 ³ / ₄ | 5 16 10 | 2 16 6 ³ / ₄ | .. | 8 13 4 ³ / ₄ | 2 11 0 ³ / ₄ | 6 2 4 | .. | .. | .. | 4 | |
| | Average of 1869 | 4 ³ / ₄ | | | | | | | | | | | | |
| | Common Grasses— | | | | | | | | | | | | | |
| 5 | 1867, E. Wet Flats | 8 | .. | .. | .. | .. | 7 0 0 | 3 17 6 | 3 2 6 | .. | .. | .. | 5 | |
| | Water Meadows— | | | | | | | | | | | | | |
| 6 | 1867, Croft and Pasture. | 10 ¹ / ₄ | .. | .. | .. | .. | 8 0 0 | 2 16 6 | 5 3 6 | .. | .. | .. | 6 | |
| | Pasturage— | | | | | | | | | | | | | |
| 7 | 1868 | 21 ¹ / ₂ | ... | .. | .. | .. | 3 6 8 | 0 14 4 ¹ / ₂ | 2 12 3 ¹ / ₂ | .. | .. | .. | 7 | |
| 8 | 1869, Tail Race | 6 | .. | .. | .. | .. | 1 6 8 | 0 13 0 ¹ / ₂ | 0 13 7 ¹ / ₂ | .. | .. | .. | 8 | |
| 9 | 1870, " " | 5 ¹ / ₂ | .. | .. | .. | .. | 2 18 11 ¹ / ₂ | 4 6 9 ¹ / ₄ | .. | .. | .. | .. | 9 | |
| 10 | 1871, Tail Race, &c. | 9 | .. | .. | .. | .. | 2 13 8 | 0 0 5 | 2 13 3 | .. | .. | .. | 10 | |
| 11 | Average of 1868-71 | .. | .. | .. | .. | .. | 2 11 6 | 1 8 1 | 2 10 | .. | .. | .. | 11 | |

The Mangold Crop and its loss of weight when pitted.

should yield less than plot No. 2, without it. This lies, it will be noticed, entirely in the second cutting; for in the first it is $5\frac{1}{2}$ cwts. superior; or, including the burst plants, it was 17 cwts. superior. Both the bailiff and the gardener had, however, to admit that in this one trial at any rate, cabbages as good and heavier, had been grown by the chemical manure.

The cabbage manure in this experiment contained 330 lbs. of sulphate of ammonia, 157 lbs. of muriate of potash, and 780 lbs. of superphosphate. The potato manure contained 70 lbs. less of the first, 200 lbs. less superphosphate, and 70 lbs. more potash. It thus seems that the largest supply of potash was better for gross yield; but the cabbage manure gave the heaviest plants.

In this experiment, 12 tons 4 cwts. was the heaviest weight grown per acre; and in some experiments in drougthy 1868, 10 tons 16 cwts. was the highest; and half this weight nearer the average. But neither year was favourable; and very much heavier crops had been grown on the farm, but as no accounts of these were kept, nothing certain can be stated.

The cabbage crop, on the whole, shows an average profit of 17s. 8d. per acre—increased to £2 17s. 8d., if £2 (about one-third of expenditure) is allowed for unexhausted manure and tillage.

Compared with turnips, they always paid well: and even in 1868, when, through want of rain, the turnip crop returned only £2 16s. $4\frac{1}{4}$ d. per acre, cabbages returned £11 2s. 7d., and lost less by over £4. They generally cost more by about £4 per acre, but the surer and larger return more than balanced this; and when well manured, they can be recommended, as supplying a heavy acreage of sheep or cattle food of the best feeding quality. The variety chiefly used was the Drumhead cabbage.

MANGOLD, also on Cropping Sheet No. 3, resembled the cabbage crop, in standing the drought of 1868 much better than the Swede turnip crop. It also cost more than turnips, but returned proportionally much more than it cost, showing an average profit of 3s. $1\frac{1}{4}$ d. per acre, increased to over £2 by the improved condition of the land. The 19 cwt.

Italian Rye-grass and the cost of our Irrigation.

per acre of potato manure used for it in 1870, contained about 4 cwt. of sulphate of ammonia, $3\frac{3}{4}$ cwt. of muriate of potash, 9 cwt. of superphosphate, 1 cwt. of salt, and 1 cwt. of gypsum; and the yield per acre was nearly 19 tons, selling or about a guinea a ton.

Mangold is generally stored in pits for spring use, and of course loses much weight by this process. On Oct. 26th, 1868, we stored 2008 stones of mangold in a good pit; and on March 5th, 1869, 130 days after storing, the pit was opened and the roots dressed and weighed. The result was a loss of 608 stones, or nearly one-third of the autumn weight.

Compared with Swedes, they proved more profitable by over £5 per acre; but the soil was always selected, which accounts for much of this difference. The seed was generally a mixture of the long red and yellow mangolds.

4. ITALIAN RYE-GRASS, liquid manured, is next in turn, on Cropping Sheet No. 4. This crop was with Mr. Lawson always a favourite, but with the bailiffs a bugbear. From the first, it had been intended to use the cattle manure in the liquid form only, after the plan of Alderman Mechi, of Tiptree Hall, and Mr. Blackburn, of Aldershot. The byres were planned for this, the cattle lying on open boards, from which the manure was washed by hose and jet, down through wide drains into two circular tanks, each 12 feet deep and 30 feet in diameter. From these tanks a large double force-pump sent the manure through about three-fourths of a mile of underground cast-iron piping, chiefly of 5-inch bore; this was tapped by various hydrants in the fields, from which the liquid was distributed by hose (each nozzle discharging about 144 gallons per minute) over 25 acres of farm and 8 acres of garden land. The cost of all this was considerable, being about £700 up to the end of 1865; and amounting to nearly £900 before the estate was sold.

At first, pretty full advantage was taken of this, and nearly twenty acres were kept under irrigation; but even before the cattle were all sold off, the acreage had dwindled down to four. The latest trial of it was on the Moss field. The second bailiff had an idea that this field was well adapted

Our three Cuttings of Italian Rye-Grass.

for irrigation, and forthwith an additional 200 to 300 yards of piping were laid down ; but the only result was four acres of Italian rye-grass. More would probably have been grown, but that the keeping of cattle was shortly afterwards almost entirely given up; thus reducing both the quantity of manure, and the demand for its use.

Six cuttings of this crop should have been obtained annually; but two, and sometimes three, were more usual in practice. The fault was, that no one took sufficient interest in it, and consequently no fair trial was ever made of its capabilities.

Looking now at the cropping returns, that for 1867 is too much of an estimate for dependence ; but in this year only has a charge been made for irrigation and the tank liquid. No accounts were kept of those items, but as the above was charged when the system was in full action, it is probably not too high at any rate. The estimate of 1867 is based upon three cuttings of 10 tons each; *one* cutting of 10 tons per acre has been obtained in the middle of summer; but the other two cuttings would be nearer 5 and 3 tons. For in 1869, with little or nothing about irrigation, 3, 6, and $1\frac{1}{4}$ tons respectively were obtained in three cuttings; so that 5, 10, and 3 would be about the real weights under heavy irrigation. This, however, shows the crop a loss; and such, with us, it undoubtedly was.

In 1869 the first cutting was on 7th June, and weighed 10 tons $16\frac{1}{2}$ cwts.; the second, in July, weighed about 21 tons, of which $4\frac{1}{4}$ tons were used green, and probably $17\frac{1}{2}$ tons were dried to make up the 692 stones of inferior hay. Cuttings were also obtained in August, a few tons being cut almost daily; the date of the last being August 21st. These weighed, per acre, nearly 3 tons for the first, 5 tons 19 cwts. for the second, and 1 ton $5\frac{1}{2}$ cwts. for the third cutting; or a total of 10 tons $4\frac{1}{2}$ cwts.,—rather a poor return for Italian Rye-grass.

Had 1869 been as hot as 1868, and the irrigation frequent, this might have been nearly doubled; for it is in hot weather that water is the most powerful manure. As it is, the lea hay crops of 1869 nearly equal the Italian rye-grass in weight,

Common Grasses Liquid-manured.

and exceed it in value; but the expenses on lea hay were heavier, if nothing is charged for the tank liquid on the Italian rye-grass; and for this reason only the latter stands superior by 9s. per acre. This applies, however, only to the Moss land, the one acre of Longlands being all made into hay; and the fog being also grazed in autumn; showing it better, on the whole, by about 25s. per acre.

One reason for the later neglect of this crop, was a belief that our open gravelly land was unsuitable for liquid manure. Because, unless soils contain a fair amount of clay or peaty matter, they are more likely to lose than gain in richness by frequent washing with a highly diluted liquid manure. Dr. Voelcker confirmed this idea when he saw the farm: and his recent analyses of Messrs. Lawes and Gilberts' drainage waters supports it.

In the garden, however, irrigation was found very useful for strawberries and rhubarb, which grew and paid amazingly under its use;—strawberries under its kindly showers, returning about £49 per acre, and the rhubarb at the rate of £68 5s. per acre; these figures being the actual returns in 1869 from nearly one acre of strawberries, and quarter of an acre of rhubarb.

COMMON GRASSES, liquid manured (also on Cropping Sheet No. 4), were tried for four or five years on East Wet-flats, which was also planted with fruit trees. Being near to the steading, it was continually under the scythe as long as cattle were kept; but the trees did only poorly, and in 1868 this field was broken up for oats. That the long course of liquid manuring had not enriched it much, is well proved by a reference to the potato experiments, series E, which were afterwards tried on this field; the three unmanured plots, Nos. 1, 5, and 10, showing an inferior condition of land to that of series C or D, both of which, in the same year, gave nearly a ton per acre more produce; though unmanured potatoes had been on C and D the previous crop also. A glance at the Potato Cropping Sheet, No. 8, also confirms this observation, East Wet-flat giving the lowest return of the three fields of 1869. In 1868, too, when this field was in Oats, though the accounts of each field were not kept

Water Meadows and Pasturage.

separate, yet the stooks were counted; and these, if any guide, show this field the lowest but one in that year, it having only $50\frac{1}{2}$ stooks per acre, the average of the year being only $61\frac{1}{2}$ stooks (over $95\frac{1}{2}$ acres).

In 1867, under irrigation, this crop is charged £2 for manure; this is probably for the tank liquid: but 1867 is too much of an estimate to be reliable. If for liquid manure, then the Common grasses were not far behind the Italian rye-grass for profit, this £2 reducing the difference to about £1 per acre: but even at the best, the ordinary lea hay crop was superior to the irrigated Common grasses.

WATER MEADOWS have also a line in Cropping Sheet No. 4. Two fields are included, both old meadows;—the one, the Tail-race field, appearing again as “Pasturage,” in 1868-69-70; the other as Meadow hay till 1870, when it was broken up for oats. Both fields lay convenient to the head-race for irrigation, and at first were pretty well looked after; but by the time that careful accounts were kept, the interest of novelty was gone, the watering became irregular and spasmodic; and the crops were lumped in the general hay and grass crops of 1869. The Tail-race field was systematically watered in the Spring, but being used mainly for horse pasturage, the benefit is not so apparent, only £1 6s. 8d. per acre being charged against the horses, as the soft condition of the soil prevented the full use of the field. This estimate for 1867 is, however, about the mark; but as no other year offers, little can be said about it.

PASTURAGE concludes Cropping Sheet No. 4. The returns are small, however, as the field was kept more because of its convenience for the horses and two cows. It shows, in consequence, only a poor profit. In the Spring of 1869 $61\frac{1}{2}$ tons of swede turnips were consumed on it, by 256 sheep in 38 days. The charge of 1d. per day per sheep all went to the credit of the turnips; but the field was cropped so thoroughly, that only £1 6s. 8d. per acre was allowed for its further use by the farm horses. The sheep manure, however, improved it for next season. In 1870 this field was also composted pretty heavily, and top-dressed besides with 8 cwts. per acre of grass manure; but as our horses

Importance of the Hay Crop in Rotation.

and stock were insufficient to pasture it to advantage, the returns per acre were still meagre.

The year 1868 stands highest in the "income" column; the reason being, that so dry was the summer, and so scarce was food for stock, that every green thing was eagerly purchased; and, our fields being in pretty good condition, they were speedily stocked to the utmost. The following is a statement of the stock grazed on 20½ acres of Gill-bushes and Gill-heads:—

STOCK GRAZED ON 20½ ACRES IN 1868.

| | | | |
|--|-----|----|-----|
| 51½ Ewes and Wethers, for 143 days, at 6d. per week .. | £26 | 7 | 10½ |
| 63 Lambs, „ 143 „ at 4d. „ .. | 21 | 10 | 6 |
| 7½ Young Cattle, at £2 10 0 each .. | 18 | 15 | 0 |
| 2 Horses, at £5 0 0 each .. | 10 | 0 | 0 |
| Total on 20½ acres | £76 | 13 | 4½ |

This gives £3 14s. 10d. per acre, and as the Cropping Sheet shows 21½ acres, there was probably another acre idle or unusable, the addition of which brings down the average income to £3 11s. 4d. per acre.

The four years show an average profit of £1 2s. 10d. per acre, which is very low, indeed; but the field was left in much higher condition at the end of our occupation; and able to carry a much greater head of stock than we had to put on to it.

5. LEA HAY, on Cropping Sheet No. 5, was always a profitable crop, and presents many features of interest, though it was one that we avoided in our early farming, having grown in 1867 only 27 acres. This crop is very important in a rotation, especially where but little farmyard manure is available; as its stubble supplies many valuable tons per acre of vegetable mould. This mould, on heavy land, promotes friability, and on light land is the great retainer of manures; keeping them out of the drains and within reach of the plants. Our experience teaches this very pointedly, as regards light soils at any rate; as those fields seldomest in hay proved the poorest.

Lea Hay—Actual Cost of Growing and Marketing for Four Years.

No. 5.—LEA HAY CROPS FOR FOUR YEARS.—OUTLAY PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acres. | Cultiva- tion. | | | Seed. | | | Manure. | | | Harvesting | | | Housing. | | | Delivery. | | | Total Outlay. | No. | | |
|-----|-------------------------|--------|-------------------|----|-----|-------|----|-----|---------|----|----|------------|----|-----|----------|----|-----|-----------|----|----|------------------|-----|-----|----|
| | | | £ | s. | d. | £ | s. | d. | £ | s. | d. | £ | s. | d. | £ | s. | d. | £ | s. | d. | | | | |
| 1 | 1869, Fitz Field | 16½ | 0 | 11 | 4½ | 0 | 12 | 1 | 2 | 1 | 1½ | 0 | 10 | 0 | 0 | 15 | 3½ | 0 | 1 | 7½ | 4 | 11 | 6½ | 1 |
| 2 | " Bore Hole | 6 | 0 | 5 | 6½ | 0 | 12 | 1 | 1 | 7 | 10 | 0 | 9 | 3½ | 0 | 10 | 10½ | 0 | 4 | 0 | 3 | 9 | 8½ | 2 |
| 3 | " W. Wet Flat | 10½ | 0 | 9 | 1½ | 0 | 11 | 3 | 1 | 10 | 5½ | 0 | 10 | 5½ | 0 | 13 | 4½ | 0 | 4 | 3½ | 3 | 18 | 11½ | 3 |
| 4 | " Great Moss | 12 | 0 | 2 | 9½ | 0 | 11 | 7 | 0 | 10 | 3½ | 0 | 10 | 8½ | 0 | 8 | 3½ | 0 | 5 | 3½ | 2 | 9 | 0½ | 4 |
| 5 | " W. Longlands | 8½ | 0 | 6 | 3½ | 0 | 12 | 5½ | 1 | 5 | 9½ | 0 | 11 | 7½ | 0 | 11 | 3 | 0 | 3 | 2½ | 3 | 10 | 7½ | 5 |
| 6 | 1870, Festival Field | 34½ | 0 | 5 | 7½ | 0 | 9 | 3½ | 3 | 6 | 7½ | 0 | 10 | 5½ | 0 | 10 | 9½ | 0 | 4 | 2 | 5 | 6 | 11½ | 6 |
| 7 | " Gillgooden | 24½ | 0 | 5 | 8 | 0 | 7 | 10½ | 4 | 5 | 8½ | 0 | 9 | 4 | 0 | 8 | 8½ | 0 | 3 | 7½ | 6 | 0 | 11½ | 7 |
| 8 | " Far Pasture | 6½ | 0 | 2 | 5 | 0 | 12 | 2 | 4 | 6 | 7½ | 0 | 8 | 6½ | 0 | 9 | 2 | 0 | 3 | 10 | 6 | 2 | 9 | 8 |
| 9 | Average of 1868 | 67½ | 0 | 3 | 10½ | 0 | 11 | 1½ | 1 | 19 | 3 | 0 | 13 | 8 | 0 | 6 | 1 | 3 | 14 | 0 | 3 | 14 | 0 | 9 |
| 10 | Average of 1869 | 57½ | 0 | 6 | 11½ | 0 | 11 | 0 | 1 | 6 | 1 | 0 | 9 | 11½ | 0 | 11 | 6½ | 0 | 3 | 3 | 3 | 8 | 9½ | 10 |
| 11 | Average of 1870 | 77½ | 0 | 4 | 11½ | 0 | 8 | 9½ | 3 | 12 | 0½ | 0 | 10 | 1½ | 0 | 10 | 0½ | 0 | 3 | 10 | 5 | 9 | 9 | 11 |
| 12 | Average of 1871 | 112½ | 0 | .. | 0 | 14 | 6 | 2 | 15 | 7½ | .. | .. | .. | .. | 4 | 16 | 7½ | .. | .. | .. | .. | .. | .. | 12 |

Lea Hay—Yield and Profit per Acre.

No. 5.—LEA HAY CROPS FOR FOUR YEARS.—RETURN AND PROFIT PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Hay per Acre. | | Fog. | | Total Return. | | Total Outlay. | | Profit. | Preceding Crop. | No. |
|-----|-------------------------|----------|---------------|---------|----------|----------|---------------|----------|---------------|---------|---------|-----------------|-----|
| | | | Stones | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | | | |
| 1 | 1869, Fitz Field | 16½ | 307½ | 7 16 9½ | 0 6 11½ | 8 3 8½ | 4 11 6½ | 3 12 2 | Oats. | 1 | | | |
| 2 | " Bore Hole | 6 | 332 | 8 16 10 | 0 16 10½ | 9 13 8½ | 3 9 8½ | 4 0 | Barley. | 2 | | | |
| 3 | " W. Wet Flat. | 10½ | 325½ | 8 13 8¾ | 1 3 0¾ | 9 16 9½ | 3 18 11½ | 5 17 10 | Wheat. | 3 | | | |
| 4 | " Great Moss | 12 | 287½ | 7 5 4½ | 1 1 5 | 8 6 9½ | 2 9 0½ | 5 17 9½ | Oats. | 4 | | | |
| 5 | " W. Longlands | 8¾ | 423 | 11 2 7 | 1 9 6½ | 12 12 1½ | 3 10 7½ | 1 6½ | Wheat. | 5 | | | |
| 6 | 1870, Festival Field. | 34¾ | 319¾ | 8 5 3¾ | 0 8 5 | 8 13 11¾ | 5 6 11¾ | 3 7 0 | Oats. | 6 | | | |
| 7 | " Gillgooden | 24½ | 267 | 7 8 11½ | 0 16 1 | 8 5 0½ | 6 0 11½ | 4 1½ | Wheat. | 7 | | | |
| 8 | " Far Pasture | 6½ | 303 | 8 3 6½ | 0 8 7 | 8 12 1½ | 6 2 9 | 2 9 4½ | .. | 8 | | | |
| 9 | Average of 1868 | 67¾ | 295 | 9 3 11¾ | .. | 9 3 11¾ | 3 14 0 | 5 9 11¾ | .. | 9 | | | |
| 10 | Average of 1869 | 57½ | 310½ | 7 18 9 | 0 17 0½ | 8 15 9½ | 3 8 9½ | 5 7 0½ | .. | 10 | | | |
| 11 | Average of 1870 | 77½ | 295½ | 7 16 7½ | 0 13 7½ | 8 10 2¾ | 5 9 9 | 3 0 5¾ | .. | 11 | | | |
| 12 | Average of 1871 | 112¾ | 345 | 8 8 6½ | 1 4 0 | 9 12 6½ | 4 16 7½ | 4 15 10¾ | .. | 12 | | | |
| 13 | Average of 1868-71 | 315¼ | 311½ | 8 6 11½ | .. | 9 0 7½ | 4 7 3½ | 4 13 4½ | .. | 13 | | | |

Irrigation at less than One Shilling per 100 Tons.

The Fitz field, first in this sheet, is a good illustration of this. It came into our possession in 1865, probably in oat stubble, so that this was at least the seventh year since the last hay crop. It gave in 1869—the Moss excepted—the lowest yield of hay, although it got the most manure.

Longlands (West), No. 5 (or Rettory, or Irrigation field,—for it had many aliases), which gives the heaviest yield and greatest profit, had been two years in Italian rye-grass under irrigation, and had since been only two years under tillage in potatoes and wheat. Both West Wet-flat and Borehole were perhaps as long out of hay; but they were of a stiffer nature, and could better stand the constant cropping: for clay is also a retainer of manures. It is doubtful if the five short liquid dressings Longlands had, helped it much; the dates, &c., were November 24th, 11 hours; ditto 25th, 3 hours; December 12th, 9 hours; January 7th, 4 hours; and March 5th, 4 hours. Actual experiment gave the discharge through our $\frac{3}{4}$ -inch nozzle as 8660 gallons per hour. At this rate, each acre had 137 tons, or just equal to one good day's rain, from all five dressings; and as the liquid was exceedingly dilute, the manurial value would be but slight. The labour of application was, however, very small—just under one shilling per 100 tons; the pumps, driven by the turbine, requiring almost no attention, and two women sufficing to work the hose. The value of this power in a drougthy summer was great; but in 1868, when by its aid we might have grown double crops of hay, unluckily none of the fields within reach were under grass.

The Moss, No. 4, was a meadow in 1861, and was not broken up probably till 1864 or 1865; its soil was, however, quite of a different nature from that of the other fields, being soft and peaty. No manure was given to it, in case the crop should be laid,—a needless care, evidently; as this field gave the poorest yield of the season, only 36 cwts. of hay per acre. This, however, was no doubt largely due to 6 days grazing in April (16th-23rd), when 256 sheep cropped it pretty closely, at 10s. 8d. per acre. In December of the same year it was again grazed for 10s. 8d. per acre. Both of

Yield of Hay in 1868 and 1870.

these items are entered in the column for fog. All the fog of 1869 was grazed ; but the Fitz field could only stand 6s. 11¼d. per acre, and the Moss 10s. 9d., while West Longlands proved four times better than the Fitz, and nearly three times better than the Moss.

Looking now at 1870, it is difficult to see why Gillgooden, No. 7, should give the smallest yield. The two men who spread the grass manure did it, indeed, badly, to annoy the bailiff; but the Festival field fared no better at their hands. Some of our practical men held that the thrice grubbing for the previous wheat crop was against the clover; but if so, it gave, at any rate, the best wheat crop. Some held that it was clover sick, which seems more probable, it being just one year out of hay. The soil of this field, too, was about the stiffest on the farm; and it could, perhaps, least stand the cold Spring of 1870. This field, when under hay after wheat in 1868, gave the lowest weight.

The three fields of 1868 yielded as follows :—

| | | | | | | |
|-------------------|-----|--------|----|-----|-----|-------|
| Mid-Heads, - - - | 322 | stones | of | hay | per | acre. |
| East-Heads, - - - | 284 | „ | „ | „ | „ | „ |
| Gillgooden, - - - | 280 | „ | „ | „ | „ | „ |

Far Pasture, No. 8, came into our hands only this season (1870), and, being poor in condition, required much manure.

All the fog of 1870 was eaten in October by sheep at 6d. per week, and lambs at 4½d., and Gillgooden grazed besides some horses at 8d. per acre up till Candlemas, 1871.

Hay returns are also given for 1871, but not for each field; the auction sale having prevented the separation of the details of marketing. But all the gross weights of hay stacked from each field are available, and will be made use of presently. But, first, some deduction must be made for loss of weight in the stack: for the weights given in the cropping sheet are not those direct from the field, but the selling weight; and between these two there is a considerable difference, as the following facts show:—

One Ton of Grass makes Five Cwts. of Hay.

TABLE III.—LOSS IN WEIGHT OF HAY IN THE STACK.

| Year. | Weighed into the Stacks. | Weighed out of the Stacks. | Loss of Weight. | Loss per Cent. |
|--------|-----------------------------|-------------------------------|-----------------|-------------------|
| | Tons cwts. qrs. | Tons cwts. qrs. | Tons cwts. qrs. | |
| 1868 | 140 8 1 | 120 14 1½ | 19 13 3½ | 14·02 |
| 1869 | 141 14 3 | 126 12 1 | 15 2 2 | 10·67 |
| 1870 | 62 16 2 | 53 15 0 | 9 1 2 | 14·44 |
| Total, | 344 19 2 | 301 1 2½ | 43 17 3½ | 12·73 |

This loss was not a constant quantity for every year, nor did it depend altogether upon the length of time the hay laid in stack. For, in 1869, when the loss was least, the hay was not all sold till June, 1870; whereas in 1870, when it was greatest, all was sold off by March, 1871. The loss, it will be seen, varied from about 14½ to 10½ per cent., the average being about 12¾ per cent., or nearly one-eighth the gross weight; equalling a loss of nearly 20½ stones of hay in each ton; and, this being the average on 344 tons, it may be relied upon as pretty safe.

Grass drying into hay loses nearly three-fourths of its weight. Numerous trials on the experimental hay crops gave an average of 30½ lbs. of hay from each 100 lbs. of grass. But this was the weight in cock, and there would be a further loss before it was placed in the stack. If this amounted to about 6 per cent., then the additional loss of one-eighth in the stack would bring the total loss of weight as between mowing and selling to exactly three-fourths, that is, every ton of grass making 5 cwts. of hay.

For 1871 the field weights are all available: and deducting one-eighth for loss of weight in the stack, the selling weights should stand as below. An abundant fog, or aftermath, was also mown on some of the better fields, and made into hay. The weights given for this are those of the field, less one-seventh, as it would probably lose more than the first hay crop. Only the larger fields are given.

The Hay Crop of 1871.

TABLE IV.—WEIGHT PER ACRE OF HAY IN 1871.

| Name of Field. | Acre-age. | Hay per acre. First Cutting. | Hay per acre. Second Cutting. | Preceding Crop. |
|----------------|------------------|---------------------------------|----------------------------------|--------------------|
| Mid Heads, | 17 $\frac{3}{4}$ | 409 stones. | 160 $\frac{1}{4}$ stones. | Wheat. |
| Mire-Ings, | 15 | 340 $\frac{1}{4}$ „ | 79 „ | Oats. |
| Wet-flats, | 24 $\frac{3}{4}$ | 340 $\frac{1}{2}$ „ | 90 „ | Wheat. |
| West Heads, | 24 $\frac{1}{4}$ | 304 „ | ... | Oats. |
| Nursery, | 6 $\frac{1}{4}$ | 280 „ | ... | Oats. |

Mid Heads, the best of this season, was also the best in 1868, when it gave 322 stones per acre. It shows, however, a great advance this year, giving 87 stones more hay per acre in the first crop; and yielding in both cuttings a weight of 3 tons 11 cwts. and 17 lbs. per acre. But even this is only the supposed selling weight, the actual weight put into the stack being 4 tons 1 cwt. and 3 quarters per acre.

Wet-flats field shows also a marked improvement over its crop of 1869; when it grew, at least, 15 stones less per acre.

Nursery field is another of the *never-resting* fields. In 1861 it was in second-year's grass; and if in 1864 it was under turnips (as is probable), then 1871 is its first year in grass since, at least, 1862. But the effect of this will be considered immediately, when some lessons on Rotation will be drawn from our erratic cropping.

West Heads was last in hay in 1867, and should have given as good a hay crop in 1871 as Mid Heads. Why it did not it is difficult to say. The chief difference in their cropping was that in 1869, when both were under potatoes, the crop on Mid Heads was after lea, and that on West Heads after oats. I am inclined to believe that the lea stubble of Mid Heads was eminently useful in retaining the unexhausted potato manure, as decomposing vegetable matter has great power in this respect. Some facts and suggestions on this point will be found in chapter xvii. on "Manures," when farm-yard manure is under consideration. (See also Index).

The heavy Fog of 1871 was all sold as hay, along with the

Good Returns for Lea Hay in 1868.

spring crop ; and the whole realised £9 10s. 6¼d. per acre. Of this sum 22s. has been debited as for fog, and the rest to the spring crop. Besides this, there is also entered in the fog column 2s. per acre for grazing, making the total there £1 4s. per acre.

Looking now at the annual averages of the four years, 1868, No. 9, shows best in the profit column: not that it grew the heaviest crop, but because of the high prices ruling that year. Indeed, it shows the lightest crop ; but the average price obtained per stone for that year was nearly 7 ½d., or almost 1 ½d. per stone above the average of the three years following. The summer was excessively dry ; and though Cumberland had a very fair hay crop, yet its browned and bare pastures, and deficient turnip crops, all tended to raise the price of hay. Abundance of rain, too, fell in August ; and the fog, thus refreshed, carried afterwards a deal of stock. From the want of hedges, grazing was, however, always an expensive process with us ; as stakes, nets, and hurdles had to be erected and looked after.

In this year, Mid Heads, the field heaviest for hay, both in 1868 and 1871, and measuring about 17 acres, grazed, between July 8th and October 26th, the following head of stock, &c. :—

TABLE V.—STOCK GRAZED ON ABOUT 17 ACRES IN THE AUTUMN OF 1868, OVER A PERIOD OF 84 DAYS.

| | | | | | |
|----|---------------------------|-------------|---------|----|----------|
| 21 | Milch Cows for 74 days at | 3s. a-week, | £31 | 16 | 0 |
| 50 | Ewes | " 15 " | } 6d. " | 3 | 0 10 |
| 51 | Ewes | " 2 " | | | |
| 75 | Lambs | " 30 " | 4d. " | 5 | 7 1 |
| 12 | Stirks | " 12 " | 2s. " | 1 | 10 7 |
| | | | | | £41 14 6 |

This sum, amounting to nearly £2 10s. per acre, is not entered in the Cropping-sheet for 1868 ; not because of any oversight, but that year's attempt being the first towards an actual statement of the expenditure and returns of each crop, only the total of each crop was taken, the accounts of

The Heaviest Yield obtained in 1872.

each field not being kept separate till 1869. Hence, in taking the totals from the ledger, the hay only was taken, as it only could fairly be divided by that year's acreage.

1869, No. 10, stands second in the profit column, and second also in weight per acre of hay. The manure applied was trifling in quantity—this year being the transition one from the abolition of cattle feeding with use of Farm yard manure to the adoption of a complete system of manuring by chemical manures only.

1870, No. 11, stands lowest in the profit column, and almost lowest in the yield of hay. The expenses against it are unusually heavy; for, in consequence of the under-manuring of 1869, it was determined to manure well this year. Unfortunately the two men employed as manure sowers had quarrelled with the bailiff about wages; and they wasted the manure, throwing it down in handfuls here and there. This spoiled the crop, most of it receiving absolutely no manure, and every yard showing several small rings of a rich, deep green colour, with a bare patch in the centre containing the handful of manure. The two men were of course discharged as unfaithful workers, but their bonus money was paid in full at the year's end. Next year's bonus offer, however, contained this significant clause: "N.B. The bonus is not payable to delinquents."

1871, No. 12, shows by far the highest weight of hay per acre: but, as has been observed in connection with the hay experiments, 1872 excelled the yield of 1871; the probable yield of 1872 being more than 400 stones per acre on those fields long in our hands, and 320 stones on fields recently acquired. The manure of 1871, though less in quantity than that of 1870, was better spread, and the result in every way satisfactory. But hay was cheap, which told against the profits, the price averaging exactly $\frac{1}{2}$ d. per stone under that of 1870. Had it sold at the same price, the crop of 1871 would have realised fully £2 an acre more. Our experience is that, both for hay and straw, a very light yield pays much better than a heavy one, the price in the former case always ruling more than proportionately higher.

Comparing now the four years of hay, and adding 1872

Our Acreage Yield of Hay for Five Years.

as given by the hay experiments,—series K of that year,—they stand as below.

TABLE VI.—COMPARISONS OF LEA HAY, 1868-1872.

| Year. | Acreage under Hay. | Weight of Hay per Acre. | Average price per Cwt. | Return for Hay per Acre. | Profit per Acre. |
|-------|--------------------|-------------------------|------------------------|--------------------------|-----------------------|
| 1868 | 67 $\frac{3}{4}$ | 295 stones. | 5s. od. | £9 3 11 $\frac{3}{4}$ | £5 9 11 $\frac{3}{4}$ |
| 1869 | 57 $\frac{1}{2}$ | 310 $\frac{1}{2}$ „ | 4s. 1d. | 7 18 9 | 5 7 0 $\frac{1}{4}$ |
| 1870 | 77 $\frac{1}{4}$ | 295 $\frac{1}{2}$ „ | 4s. 3d. | 7 16 7 $\frac{1}{2}$ | 3 0 5 $\frac{3}{4}$ |
| 1871 | 112 $\frac{3}{4}$ | 345 „ | 3s. 11d. | 8 8 6 $\frac{1}{4}$ | 4 15 10 $\frac{3}{4}$ |
| 1872 | | 380 „ | ... | ... | ... |

The greatest profit shown above is that of 1868, and is from the lightest crop. The heaviest crop does not, however, show the least profit. The rainfall of April and May has much to do with the growth of hay; but the above returns are too few in number to warrant a discussion of this question. The monthly rainfall of Blennerhasset for the four years 1868-1871 inclusive, is given in the opening of chap. xx., on Experiments upon Potatoes. That of 1872 was only taken to the end of June, and was as follows:—January, 4.71 inches; February, 3.19; March, 3.23; April, 1.63; May, 2.43; and June 1.58:—quantities, upon the whole, one-half greater than the average of the four preceding years.

The value of the hay, both as a safe and always saleable crop, was becoming better understood as we continued farming; and a steady increase of the acreage under hay will be noticed in the above comparisons, and 1872 would have shown a still larger acreage. Two-years' hay was also under trial both in 1871 and 1872. In 1871 only one field, Far Gilgooden, was tried; but having been sown down for one-year's hay only, the test is not a fair one. This field, measuring about 4 acres, gave, in 1870, 8 tons 18 cwts.; and in 1871 only 8 tons $\frac{3}{4}$ cwt. And, the land not having been cleaned sufficiently for a second crop, the hay was of inferior quality. A smaller experiment tried in 1869 and 1870, on 1613 square yards of the experimental field, was

Mowing Land Two Years for Hay.

more successful. The land was well cleaned, and the seeds sown down in 1868 with barley, half of which was dunged. The two halves, each about 400 feet long by 18 feet broad, were again halved, and to the southern halves of each, 2 cwts. per acre of nitrate of soda was applied; and to the northern halves, 4 cwts. per acre of a grass manure. In 1870 nearly the whole of the plot dunged for barley was dressed with 2 cwts. per acre of sulphate of ammonia; and the other plot with 3 cwts. of the same, and, in addition, 4 cwts. of superphosphate, $1\frac{1}{2}$ cwt. muriate of potash, and $\frac{1}{2}$ cwt. salt. The returns of hay were as follows:—

TABLE VII.—PRODUCE OF A PIECE OF LAND MOWN TWO YEARS, FOR HAY.

| Manures for the Barley. | Manures in 1869. | Weight of Hay per Acre. | |
|-------------------------------|--------------------|-------------------------|-------------|
| | | 1869. | 1870. |
| Dung, 15 tons. | { Nitrate of Soda. | 454 stones. | 418 stones. |
| | { Grass Manure. | 423 „ | 445 „ |
| Corn Manure, &c. | { Nitrate of Soda. | 425 „ | 401 „ |
| 9 cwts. | { Grass Manure. | 364 „ | 446 „ |
| Average of the four plots, .. | | 416 „ | 427 „ |

The second year's yield is in this case the heavier. It was also much richer in clover; but the cost of production was much greater, the manure of 1870 costing £2 4s. 3d. per acre more. The Cropping Sheets, however, show 1870 as, on the whole, an inferior season; which placed the second crop at a disadvantage. But this question of the year's hay, though of importance in our system of farming without cattle, is not of consequence in ordinary farming, and need not be discussed further.

A proper rotation is at the base of all good farming: and our erratic cropping furnishes some interesting lessons on this head. Now, the hay crop, being the only one of which we have separate field details for four years, supplies the greatest number of facts on this question. Examining our materials, we find fifteen fields available; two of them in 1870 and 1871, with only one crop between hay and hay; three fields,—one in 1868, one in 1869, and one 1871, with two crops between hay and hay; and the remaining ten fields as examples of no rotation. These facts are, how-

Rotation Teachings of the Lea Hay Crops.

ever, few enough; and the gaps in the different years make comparison more difficult: but, averaging for each year these three classes of rotation, the weights are as below.

| Year. | Two-course. | Three-course. | No-course. |
|-------|-------------|---------------|-------------|
| 1868 | ... | 280 stones. | 303 stones. |
| 1869 | ... | 423 „ | 313 „ |
| 1870 | 267 stones. | ... | 320 „ |
| 1871 | 340 „ | 409 „ | 308 „ |

Averaging and comparing, then, returns of the same year only (otherwise seasons would interfere), we find the three-course rotation averages 371 stones per acre, as against 308 from no rotation. Then the two-course rotation averages 304 stones against 314 from no rotation. Or to put the differences side by side—

A two-course rotation averaged 304 stones of hay.

No rotation at all averaged 10 stones heavier.

A three-course rotation averaged 63 stones heavier still.

Our experience is therefore decidedly against no rotation, and still stronger against a so-to-speak two-course rotation. A reference to "Rotation" in the Index will direct to further facts upon this question.

The average profit on Lea Hay from 315 acres, as shown by our actual expenditure and receipts for four years, was £4 13s. 4¼d. per acre; but this is below the reality, the fog pasturage of 1868 being left out—an omission which would probably add 3s. an acre; bringing the average to £4 16s.

Our grass seeds were for only one year's crop, and consisted of three pecks of perennial grass seeds per acre, mixed with 6 lbs. of Red and Alsike clovers, and about 1 lb. of Timothy. But different fields, though seeded alike, showed very different proportions of herbage.

6. MEADOW HAY, begins Cropping Sheet No. 6, on pages 256 and 257. The average return was £6 13s. 6d., the outlay £3 16s. 4½d., and the profit £2 17s. 1½d. per acre; all much less than for lea hay. The losses shown in 1870 were on fields taken into our hands only that year, and both of them in poor condition.

Estimated Expenditure on One Acre of Flax.

TABLE VIII.—COST OF GROWING AND MANUFACTURING ONE ACRE OF FLAX.

| Cultivation— | | Manufacturing— | |
|------------------------------|--------------|------------------------------|----------|
| 1 Ploughing, . | £0 10 0 | Rippling, . | £0 12 0 |
| 4 Harrowings, . | . 0 4 0 | Seed-dressing, . | . 0 10 0 |
| 2 Grubbings, . | . 0 7 6 | Steeping and Grassing, 1 0 0 | . 0 0 0 |
| 1 Clodcrushing, . | . 0 1 0 | Scutching, . | . 2 10 0 |
| 1 Rolling, . | . 0 1 0 | | £4 12 0 |
| Gathering Stones, &c., 0 3 6 | | Delivery to Purchaser, . | . 0 4 0 |
| Weeding, . | . 1 5 0 | Accidents and Insurance, . | . 4 0 0 |
| | £2 12 0 | | |
| Seed (11 Stones), . | . . . 3 11 6 | | |
| Sowing, . | . . . 0 1 0 | | |
| Pulling, . | . . . 1 0 0 | Total Manufacturing Cost, . | . 8 16 0 |
| Stacking, &c., . | . . . 0 14 6 | Total Farming Cost, . | . 7 19 0 |
| | | | |
| Total Cost to farmer, . | £7 19 0 | Total per Acre, . | £16 15 0 |

Receipts for One Acre of Flax.

| RETURNS OF FLAX PER ACRE. | | | |
|--|---|----|------|
| 34 stones of fibre, at 10s. per stone, . | £ | 17 | 0 0 |
| 60 „ seed at 2s. 4d. „ . | | 7 | 0 0 |
| Tow, shoves, steep-liquor, &c., . | | 1 | 0 0 |
| <hr/> | | | |
| Total return per acre, . . . | £ | 25 | 0 0 |
| Deduct total cost, . . . | | 16 | 15 0 |
| <hr/> | | | |
| Which leaves of profit, . . . | £ | 8 | 5 0 |

FLAX will be found on the same sheet as Meadow Hay; and its financial history in a previous chapter. In 1865 we grew about 10 acres, and in 1866 about 16; in this latter year we also first began to manufacture the fibre. The first estimated cropping expenses and returns were calculated from Irish sources, of which page 253 is a fair specimen. It shows a very handsome profit, such as we never realised.

The facts which we can give regarding the Flax crop are not many, its history belonging to the period when our details were less valued and less taken care of. But about 20 acres were purchased; and of one lot, said to have been grown upon one imperial acre, the details happen to have been preserved. This purchase, after being six months in stack, weighed, seed and all, 3 tons $2\frac{3}{4}$ cwt.: and, when rippled, there was of seed 85 stones, of chaff 81 stones, and of straw 336 stones. The straw, after steeping, &c., scutched down to 35 stones of fibre, which sold for 9s. 6d. per stone; giving, per acre, £16 12s. 6d. The price paid for the 336 stones of straw was £6 6s., being at the rate of $4\frac{1}{2}$ d. per stone. The seed was returned to the grower; but if sold at 2s. 4d. per stone (2s. 6d. was frequently obtained) it would have yielded per acre £9 18s. 4d.; making, with the return for fibre, a total of £26 10s. 10d. per acre. But these returns are much higher than our average, the straw (unmanufactured) and seed realising £16 4s. 4d.; or nearly £4 per acre above the average of our farm.

The gross weight per acre in the above was over 3 tons, but this was exceptionally high; for in 1866, four acres at Prior Hall averaged only 1 ton $11\frac{1}{2}$ cwt. per acre, and in

The Cost of Scutching Flax.

1870 our average at Blennerhasset was 1 ton 16½ cwts. per acre for straw and seed.

The cost of scutching was tested more than once; but the only record now available refers to one week in February, 1867, when our Irish foreman was still with us. In this week two men, one at 20s. and the other at 17s., and three girls at 7s. 6d. each, scutched 24 stones. This gives as the rate per stone 2s. 5½d., which, at 35 stones per acre, would show £4 6s. 9¼d., instead of £2 10s., the cost of scutching per acre. This is exclusive of the cost of rippling, steeping, grassing, and breaking; and if they, too, cost as much beyond the estimate, then the profit left, even on this good acre, would be only about £4, out of which must come rent, tear and wear of machinery, and cost of power.

The average price paid for flax straw was 4½d. per stone, but as much as 6d. was also given. The average profit of £5 10s. 10d. per acre, shown in our Cropping Sheet is, of course, the farming profit; the straw being sold at 4½d. per stone. For, when we take into account the cost of manufacture, flax was a heavy loss to us throughout.

Exclusive of the Crop expenditures, yield, and profit, which cannot be epitomised here, the main teachings of this chapter may be briefly stated as follows:—

- I. That cabbages might with advantage be substituted, in part, for swedes, as a food for sheep and lambs.
- II. That mangold roots lost nearly one-third their weight, between their being stored in pits for winter, and dressed for sale in spring, after 130 days.
- III. That our liquid manuring proved more useful for strawberries and rhubarb than for grass.
- IV. That 344 tons of hay lost in the stack nearly one-eighth its weight.
- V. That grass, in drying into hay, lost three-fourths its weight.
- VI. That under a three-course rotation the hay crop was heavier than under no-rotation.
- VII. That under a two-course rotation the hay crop gave even a less yield than under no-rotation.

No. 6.—MEADOW HAY AND FLAX CROPS.—OUTLAY PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Cultiva- tion. | Seed. | Manure. | Harvesting | Housing. | Prepara- tion. | Delivery. | Total Outlay. | No. |
|-----|-------------------------|-----------------|----------------------|----------------------|---------|----------------------|----------------------|---------------------|---------------------|----------------------|-----|
| | Meadow Hay— | | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | |
| 1 | 1870, Burtrigg | 4 $\frac{3}{4}$ | 0 9 2 | .. | 4 2 11 | 0 16 | 6 $\frac{3}{4}$ 0 14 | 3 $\frac{3}{4}$ 0 7 | 7 $\frac{1}{2}$ 0 2 | 6 $\frac{1}{2}$ 6 13 | 1 |
| 2 | „ East Cow Mire | 2 | 2 5 5 $\frac{1}{2}$ | .. | 1 19 | 4 $\frac{1}{2}$ 0 9 | 9 $\frac{1}{4}$ 0 16 | 9 $\frac{3}{4}$ 0 1 | 0 3 | 9 $\frac{1}{2}$ 5 16 | 2 |
| 3 | 1867, Average | 6 | 0 1 6 | .. | 2 0 0 | 0 16 0 | .. | 1 0 0 | .. | 3 17 6 | 3 |
| 4 | 1868, Manure Croft | 4 $\frac{1}{4}$ | 0 1 8 $\frac{1}{4}$ | .. | 1 14 | 7 $\frac{1}{2}$ 0 12 | 3 $\frac{1}{4}$.. | .. | .. | 2 8 7 | 4 |
| 5 | 1869, Manure Croft | 4 $\frac{1}{4}$ | 1 2 8 $\frac{1}{4}$ | .. | .. | 0 10 2 | 0 17 2 $\frac{1}{2}$ | .. | 0 1 | 2 $\frac{1}{2}$ 2 11 | 5 |
| 6 | 1870, Average | 6 $\frac{3}{4}$ | 0 19 11 | .. | 3 10 | 0 0 14 | 6 $\frac{3}{4}$ 0 15 | 0 $\frac{3}{4}$ 0 5 | 8 0 | 2 11 6 | 6 |
| | Flax Crop— | | | | | | | | | | |
| 8 | 1867, Two Fields | 4 $\frac{1}{2}$ | 2 15 0 | 1 2 6 | .. | 1 5 0 | .. | .. | 0 12 | 6 5 15 | 8 |
| 9 | 1868, Two Corners | 1 | 4 5 9 | 1 1 9 | 1 8 | 7 1 9 | 2 .. | .. | .. | 8 5 3 | 9 |
| 10 | 1870, Bore Hole | 4 $\frac{1}{4}$ | 3 6 11 $\frac{1}{2}$ | 1 12 3 $\frac{1}{4}$ | .. | 0 18 | 4 $\frac{1}{4}$ 0 5 | 5 $\frac{3}{4}$ 0 2 | 4 $\frac{3}{4}$.. | 6 5 5 $\frac{1}{2}$ | 10 |

No. 6.—MEADOW HAY AND FLAX CROPS.—RETURN AND BALANCE PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Hay per Acre. | | Fog. | | Total Return. | | Total Outlay. | | Profit. | | Loss. | No. |
|-----|---------------------------------|------------------|-------------------|-----------------------|---------|---------|-----------------------|----------------------|----------------------|---------|-----------------------|---------|-----------------------|-----|
| | | | Stones | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | | |
| 1 | Meadow Hay— 1870, Burtrigg . | 4 $\frac{3}{4}$ | 288 $\frac{3}{4}$ | 5 14 2 | .. | .. | 5 14 2 | 6 13 1 $\frac{1}{2}$ | .. | .. | 0 18 11 $\frac{1}{2}$ | .. | 0 18 11 $\frac{1}{2}$ | 1 |
| 2 | „ East Cow Mire . | 2 | 249 $\frac{1}{2}$ | 4 17 11 $\frac{1}{4}$ | .. | .. | 4 17 11 $\frac{1}{4}$ | 5 16 2 $\frac{1}{2}$ | .. | .. | 0 18 3 $\frac{1}{4}$ | .. | 0 18 3 $\frac{1}{4}$ | 2 |
| 3 | 1867, Average . | 6 | .. | .. | .. | .. | 7 0 0 | 3 17 6 | 3 2 6 | .. | .. | .. | .. | 3 |
| 4 | 1868, Manure Croft . | 4 $\frac{1}{4}$ | .. | .. | .. | .. | 9 3 11 $\frac{1}{2}$ | 2 8 7 | 6 15 4 $\frac{1}{2}$ | .. | .. | .. | .. | 4 |
| 5 | 1869, Manure Croft . | 4 $\frac{1}{4}$ | 280 $\frac{1}{2}$ | 4 13 6 $\frac{1}{2}$ | 0 7 2 | .. | 5 0 8 $\frac{1}{2}$ | 2 11 3 $\frac{1}{4}$ | 2 9 5 $\frac{1}{4}$ | .. | .. | .. | .. | 5 |
| 6 | 1870, Average . | 6 $\frac{3}{4}$ | 277 | 5 9 4 $\frac{1}{2}$ | .. | .. | 5 9 4 $\frac{1}{2}$ | 6 8 1 $\frac{1}{2}$ | .. | .. | 0 18 9 | .. | 0 18 9 | 6 |
| 7 | Average of 1867-70 . | 21 $\frac{1}{4}$ | .. | .. | .. | .. | 6 13 6 | 3 16 4 $\frac{1}{2}$ | 2 17 1 $\frac{1}{2}$ | .. | .. | .. | .. | 7 |
| | Flax Crop— | | | | | | | | | | | | | |
| 8 | 1867, Two Fields . | 4 $\frac{1}{2}$ | .. | .. | .. | .. | 16 10 0 | 5 15 0 | 10 15 0 | .. | .. | .. | .. | 8 |
| 9 | 1868, Two Corners . | 1 | .. | .. | .. | .. | 12 17 8 $\frac{1}{2}$ | 5 3 | 4 12 5 $\frac{1}{2}$ | .. | .. | .. | .. | 9 |
| 10 | 1870, Bore Hole . | 4 $\frac{1}{4}$ | .. | .. | .. | .. | 7 10 7 | 6 5 5 $\frac{1}{2}$ | 1 5 1 $\frac{1}{2}$ | .. | .. | .. | .. | 10 |
| 11 | Average | .. | .. | .. | .. | .. | 12 6 1 | 6 15 3 | 5 10 10 | .. | .. | .. | .. | 11 |

The Oat Crop Balance Sheets.

CHAPTER XVI.

FIELD AND CROP BALANCE SHEETS.

THE Oat Cropping Sheet No. 7, given on pages 260 and 261, gives the larger fields only. It shows profits varying from close upon £2 to £8 per acre—differences not due to season, as both returns belong to 1870. Field No. 7, however, which gives the poorest result, was one just recently acquired from a neighbouring farm. It was similar in soil to our other, being quite in the middle of our farm, but poor in condition; and, in spite of heavy “management,” its return hardly pays for the outlay.

But, to begin with 1869, Gillbushes, No. 1, shows both the best crop and the highest profit of that year;—a result not unexpected, as will be seen by a reference to the Cropping Table (page 225), which shows the previous cropping of this field to have been five successive years of grassing. The quality of the oats, however, seems to have been inferior, the average price per Carlisle bushel (3 imperials, or 126 lbs.) having been 9s. 4½d., whilst that of East Heads, No. 2, averaged 13s. 6d. In straw, Gillbushes shows also best of its season, a fact which accounts for the heavy charges for harvesting, &c.

East Heads field, No. 2, which stands next best, returns less of corn per acre, but more of money, the quality having been excellent and the price good. It was from this field that all our seed oats of 1870 were obtained.

The fields of 1870 present more variety and interest. The heaviest yield was from Mire-ing, No. 8, as also the greatest profit. In 1869 about nine acres of this field had been swedes, which were eaten off by sheep in the spring of 1870. Other six acres had been under carrots, dressed with both farmyard and chemical manures; and of the other ten acres, about half had been old meadow land. Much of it was thus in high condition, and required little or no

Salt as a Manure for Oats after Swedes.

manure. The turnip land had only 22 cwts. of salt, and the rest about 4 cwts. per acre of our corn manure.

Nursery field, No. 10, is the next best field. It had also received the manure from about 20 tons per acre of swede turnips which the sheep had consumed the same spring. About £4 per acre should have been charged for this in the manure column, or at least the larger half of it is fairly chargeable against this crop. The manure applied was mainly salt, of which $57\frac{1}{2}$ cwts. were used, to stiffen the straw. About two acres were dressed with $41\frac{1}{2}$ tons of farmyard manure, in consequence of that part of the field having been previously exhausted by four years of nursery crop. This field stands first for weight of straw, giving more than 46 cwts. per acre; and this not on a measured acre merely, but on the field acre, including headlands, ditches, and dykes. The quality of the corn was, however, low, realising only 9s. per C. bushel; the average of the year being 9s. $10\frac{3}{4}$ d. These figures are obtained by dividing the bushels into the cash in the "Good Oats" column, and multiplying by 3 for a Carlisle bushel.

The third field for corn of this year is Great Moss, No. 5, which gave eighteen Carlisle bushels of corn, but only $26\frac{1}{2}$ cwts. of straw per acre. The manure, about 4 cwts., was our usual corn manure, containing about one fourth sulphate of ammonia and two-thirds superphosphate.

Of West Heads, No. 9, eleven acres had been in turnips, which were eaten by sheep; and, as on the Nursery Field, salt was the manure applied to this part; but the wisdom of such an application is very questionable, as the reader will see by reference to "Experiments with Salt," in the Index. The other part had been under potatoes, and received for the oats the usual corn manure, as had also all the other corn fields.

Of Longlands, No. 6, which stands lowest in corn, the north-west portion, after lea, would yield much more than 44 imperial bushels, and the south-east portion, after wheat, very much less; for the latter portion was perhaps the hardest cropped part of the farm, this being the fifth white crop in seven years. So poor, indeed, was it, that in the

Oat Crop—Yield and Profit of Ten different Fields.

No. 7.—OATS CROPPING-SHEET.—RETURN AND PROFIT PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Good Oats. | | Hinder-ends. | | Straw. | | Total Return. | Total Outlay. | Profit. | Preceding Crop. | No. |
|-----|-------------------------|----------|------------|----------|--------------|---------|---------|----------|---------------|---------------|----------|-----------------|-----|
| | | | Bush. | ℓ s. d. | Bush. | ℓ s. d. | Stones. | ℓ s. d. | ℓ s. d. | ℓ s. d. | ℓ s. d. | | |
| 1 | 1869, Gillbushes | 11 | 44½ | 6 18 6½ | 4 | 0 5 6¾ | 298 | 4 12 11½ | 11 17 0½ | 4 12 8½ | 7 4 4 | Grass. | 1 |
| 2 | " East Heads | 26 | 35½ | 7 17 8 | 1 | 0 1 6½ | 232¾ | 3 9 7½ | 11 8 9¾ | 6 12 9½ | 4 16 0½ | Hay. | 2 |
| 3 | " Festival Field. | 27 | 41 | 6 18 5½ | 7½ | 0 11 4 | 224½ | 2 15 1½ | 10 4 10½ | 5 17 11½ | 4 6 11 | Swedes. | 3 |
| 4 | 1870, Fitz Field | 16½ | 50½ | 8 0 2½ | ¾ | 0 0 11½ | 210¾ | 2 3 1 | 10 4 3 | 7 6 1½ | 2 18 1¾ | Hay. | 4 |
| 5 | " Great Moss | 16 | 54½ | 8 7 11½ | 2½ | 0 4 4 | 213 | 1 16 5¾ | 10 8 9½ | 6 13 7½ | 3 15 1¾ | Hay. | 5 |
| 6 | " Longlands | 25 | 44 | 8 4 1 | 5½ | 0 5 8½ | 317½ | 3 4 2¾ | 11 14 0 | 7 3 8 | 4 10 4 | Wheat. | 6 |
| 7 | " Gillheads | 18½ | 49 | 8 14 10½ | .. | .. | 265 | 2 14 11½ | 11 9 10½ | 9 2 4½ | 2 7 6 | .. | 7 |
| 8 | " Mire-Ing | 25¾ | 60 | 9 19 2 | 1 | 0 2 0¾ | 323 | 3 7 11 | 13 9 1¾ | 1 4½ | 8 7 9½ | Meadow. | 8 |
| 9 | " West Heads | 24 | 51 | 7 18 4½ | 2½ | 0 3 9 | 257½ | 2 13 2½ | 10 15 4 | 6 16 8 | 3 18 8 | Potatoes. | 9 |
| 10 | " Nursery | 13 | 56 | 8 7 7½ | .. | .. | 369½ | 3 18 10½ | 12 6 5½ | 6 5 3 | 6 1 2½ | Swedes. | 10 |
| 11 | Average of 1867 | 52 | .. | .. | .. | .. | .. | .. | 13 0 0 | 6 7 8 | 6 12 4 | .. | 11 |
| 12 | " 1868 | 91½ | 42½ | 7 1 8½ | .. | .. | 147½ | 3 5 11½ | 10 7 8 | 4 8 5½ | 5 19 2½ | .. | 12 |
| 13 | " 1869 | 76 | 38½ | 6 19 5 | 4 | 0 6 2½ | 228¾ | 3 4 9 | 10 10 4½ | 5 18 5 | 4 11 11½ | .. | 13 |
| 14 | " 1870 | 15½ | 51 | 8 8 3½ | 2 | 0 3 0½ | 276 | 2 16 3½ | 11 7 7½ | 6 19 2½ | 4 8 4½ | .. | 14 |
| 15 | General Average | .. | 44 | 7 9 9½ | .. | .. | 217½ | 3 2 4 | 11 6 5 | 5 18 5½ | 5 7 11½ | .. | 15 |

The Corn and Straw of the Oat Crop.

year following, an experimental crop of unmanured potatoes yielded only $36\frac{3}{4}$ cwts. per acre; whilst the lowest yield previously on record was $48\frac{1}{4}$ cwts., the result not of one but of *three* years' unmanured potatoes. This field was well manured for the oats; and though the yield was small, the quality was good, the selling price being about 15d. above the average of the year. The straw, it will be observed, was also considerably above the average of the year.

Comparing, now, the different years, 1867 stands decidedly highest. A test of nearly one acre gave 24 Carlisle, or 72 imperial, bushels per acre; but probably this was from a very good part of the field. 1867 was, however, in Cumberland, the best for oats during our experience. Next stands 1870, with an average yield of 17 Carlisle bushels per acre, and about three-quarters of a bushel of hinder ends. The year 1868 exceeds it in profit only: for, although in that dry summer we had a fair crop, yet its superiority in profit is due entirely to the price obtained for the straw, which realised an average of $5\frac{1}{4}$ d. per stone. The straw of 1869 sold at $3\frac{1}{4}$ d., and of 1870 about $2\frac{1}{2}$ d. The medium quantity of straw thus paid best per acre.

The average yield of corn per acre over the three seasons, and from 319 acres, was 44 imperial, or nearly 15 Carlisle bushels, selling for £7 9s. 9d. altogether. This is, however, too low; as it excludes that splendid season 1867, when probably 20 Carlisle bushels, at any rate, were obtained. This, if included, would raise the average to 16 Carlisle or 48 imperial bushels per acre. For straw, the average return over three seasons was 217 stones, or $27\frac{1}{4}$ cwts. per acre, selling for £3 2s. 4d.

As both the corn and the straw were sold by weight, we have a ready means of comparison between the two. The oats were sold per 9 stones, or 3 imperial bushels; and a comparison of their weight with that of the straw, shows that in 1868, for every 100 lbs. of straw there were $86\frac{1}{2}$ lbs. of corn; in 1869, $50\frac{1}{2}$; and in 1870, $55\frac{1}{2}$ —the average of all three being $60\frac{3}{4}$ lbs. of corn per 100 lbs. of straw: or, to put it roughly, for every 3 stones of corn there

Potatoes Manured with Clemical Manures only.

were 5 stones of straw. Comparing the money-returns of the two, for every £1 obtained for corn, 8s. 3d. was received for straw. Both these comparisons exclude, however, the hinder ends, which are given for two of the years only.

The oat crop was, upon the whole, our most successful one. It shows very nearly the highest average profit. Wheat surpasses it as far as mere figures go; but the growth of wheat was confined to a few special fields, and its severity on the soil was much greater. Wheat was also costlier to grow, the outlay reaching £7 9s. per acre; while that of the oat crop was only £5 18s. Oat straw was also much more saleable in large quantities than wheat straw, being readily purchased both for its feeding and its paper-making qualities. Over the four years, the annual acreage outlay or expenditure on oats averaged £5 18s. 5½d.; the income, or actual receipts, £11 6s. 5d.—leaving an average profit of £5 7s. 11½d. per acre.

The returns are much too few in number to warrant any attempt at comparing the effects of the preceding crops on the yield.

8. POTATOES, detailed on pages 264 and 265, were a very frequent and favourite crop with Mr. Lawson; because they both gave much labour, and seemed to pay well. As far as can be learned from old and uncertain records, there were two acres grown in 1863, thirty-two in 1865, thirty-four in 1866, and twenty-seven in 1867. In 1868, when cattle were discarded, it at first seemed as if potatoes were in danger too; but a chemical potato manure was then made, and about four cwts. per acre were used to assist a half manuring from the farm-yard. Experiments, tried the same year, proved that, used alone, the chemical manure was quite reliable, and indeed at first it promised to prove antiseptic also, as may be seen in Chapter XX. Next year, therefore, the chemical manure was applied alone, and with the best results; our potatoes selling in Wigton market at 1d. per stone above the average, and getting a good name everywhere. And for this, the seed cannot be fairly credited, as it was bought in the usual way, in small lots in Wigton market.

Potato Crop Expenditure from Ploughing to Selling.

No. 8.—POTATO CROPS.—OUTLAY PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Grubbing. | Ploughing. | Harrowing. | Rolling. | Crushing. | Cultivation. | Seed. | Manure. | Harvesting. | Sorting. | Delivery. | Total Outlay. | No. |
|-----|-------------------------|--------------------------------|-----------|------------|------------|----------|-----------|--|--|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-----|
| 1 | 1869, E. Wet Flat . | 8 | 2 | 1 | 5 | ... | 1 | £ s. d. 4 4 10 ³ / ₄ 1 12 1 | £ s. d. 4 4 10 ³ / ₄ 1 12 1 | £ s. d. 5 0 4 ¹ / ₂ 1 7 9 ³ / ₄ 0 16 0 | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 1 |
| 2 | " Mid Heads . | 18 | 2 | ... | 2 | ... | ... | 4 10 8 ³ / ₄ 3 5 3 ¹ / ₄ | 5 8 6 2 1 10 ³ / ₄ 0 10 2 ¹ / ₂ 1 6 7 ¹ / ₄ | 5 8 6 2 1 10 ³ / ₄ 0 10 2 ¹ / ₂ 1 6 7 ¹ / ₄ | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 2 |
| 3 | " West Heads . | 12 ¹ / ₂ | 2 | 1 | 2 | ... | ... | 4 3 0 4 10 11 ³ / ₄ | 4 10 8 ¹ / ₂ 1 19 9 ³ / ₄ 0 15 7 ¹ / ₄ 1 5 3 | 4 10 8 ¹ / ₂ 1 19 9 ³ / ₄ 0 15 7 ¹ / ₄ 1 5 3 | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 3 |
| 4 | 1870, East Heads . | 25 ¹ / ₂ | 2 | ... | 3 | ... | ... | 3 9 10 ³ / ₄ 3 9 0 ¹ / ₂ | 8 11 10 1 17 7 ³ / ₄ 0 14 5 ¹ / ₂ 0 12 0 ¹ / ₂ | 8 11 10 1 17 7 ³ / ₄ 0 14 5 ¹ / ₂ 0 12 0 ¹ / ₂ | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 4 |
| 5 | " Gillbushes . | 15 | 2 | 1 | ... | ... | ... | 2 19 10 ³ / ₄ 1 11 0 ¹ / ₂ | 7 19 6 ¹ / ₂ 2 12 1 ¹ / ₂ 0 12 2 ¹ / ₄ 0 8 2 | 7 19 6 ¹ / ₂ 2 12 1 ¹ / ₂ 0 12 2 ¹ / ₄ 0 8 2 | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 5 |
| 6 | " Bore Hole . | 10 ¹ / ₂ | 2 | ... | 4 | ... | ... | 3 16 2 1 19 0 | 10 13 2 ¹ / ₂ 2 10 4 0 15 0 ¹ / ₂ 0 6 1 ¹ / ₂ | 10 13 2 ¹ / ₂ 2 10 4 0 15 0 ¹ / ₂ 0 6 1 ¹ / ₂ | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 6 |
| 7 | " Beaty's Croft . | 15 ³ / ₄ | 2 | ... | 5 | ... | ... | 3 7 11 ¹ / ₂ 2 2 9 | 5 19 9 2 3 10 0 14 0 ¹ / ₂ 0 10 5 ¹ / ₂ | 5 19 9 2 3 10 0 14 0 ¹ / ₂ 0 10 5 ¹ / ₂ | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 7 |
| 8 | Average of 1868 . | 16 ¹ / ₂ | ... | ... | ... | ... | ... | 2 13 6 ¹ / ₂ 2 12 10 ³ / ₄ | 4 16 1 ¹ / ₂ 2 3 11 ³ / ₄ 0 9 9 0 7 6 | 4 16 1 ¹ / ₂ 2 3 11 ³ / ₄ 0 9 9 0 7 6 | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 8 |
| 9 | " 1869 . | 38 ¹ / ₂ | ... | ... | ... | ... | ... | 4 6 11 ³ / ₄ 3 6 10 ³ / ₄ | 5 0 11 ³ / ₄ 1 18 3 ³ / ₄ 0 13 2 1 2 11 ¹ / ₄ | 5 0 11 ³ / ₄ 1 18 3 ³ / ₄ 0 13 2 1 2 11 ¹ / ₄ | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 9 |
| 10 | " 1870 . | 66 ¹ / ₂ | ... | ... | ... | ... | ... | 3 8 2 2 9 7 ¹ / ₄ | 8 3 1 ¹ / ₂ 2 4 0 13 11 ¹ / ₄ 0 9 10 ¹ / ₂ | 8 3 1 ¹ / ₂ 2 4 0 13 11 ¹ / ₄ 0 9 10 ¹ / ₂ | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 10 |
| 11 | " 1871 . | 99 ¹ / ₂ | ... | ... | ... | ... | ... | 3 15 0 4 5 0 ¹ / ₂ | 6 13 1 ¹ / ₄ 7 4 ¹ / ₂ 0 2 6 ¹ / ₄ 0 2 1 ³ / ₄ | 6 13 1 ¹ / ₄ 7 4 ¹ / ₂ 0 2 6 ¹ / ₄ 0 2 1 ³ / ₄ | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 11 |
| 12 | " 1868-71 . | 221 | ... | ... | ... | ... | ... | 3 10 11 3 3 7 ¹ / ₂ | 6 3 4 1 18 6 0 9 10 0 10 7 ¹ / ₂ | 6 3 4 1 18 6 0 9 10 0 10 7 ¹ / ₂ | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | £ s. d. £ s. d. £ s. d. | 12 |

Potato Crop—Yield, Profits and Losses of Four Years.

No. 8.—POTATO CROP.—RETURN AND BALANCE PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Large Potatoes. | | Pig Potatoes. | | Total Return. | | Total Outlay. | | Profit. | Loss. | Preced- ing Crop | No. |
|-----|-------------------------|----------|-----------------|-----------|---------------|---------|---------------|-----------|---------------|---------|---------|---------|---------------------|-----|
| | | | Stones | £ s. d. | Stones | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | | | | |
| 1 | 1869, E. Wet Flat . . | 8 | 541½ | 10 3 4½ | 382 | 3 0 1½ | 13 3 5½ | 13 12 2 | ... | £ s. d. | £ s. d. | 0 8 8½ | Oats | 1 |
| 2 | " Mid Heads . . | 18 | 614 | 13 13 11 | 262½ | 3 3 7½ | 16 17 6½ | 17 3 2½ | ... | ... | ... | 0 5 8½ | Hay | 2 |
| 3 | " West Heads . . | 12½ | 643 | 12 5 4½ | 313½ | 3 19 3½ | 16 4 7½ | 17 5 4½ | ... | ... | ... | 1 0 8¾ | Oats | 3 |
| 4 | 1870, East Heads * . . | 25½ | 1189 | 14 18 11½ | 298½ | 3 10 6¾ | 18 9 6½ | 18 14 11 | ... | ... | ... | 0 5 4¾ | Oats | 4 |
| 5 | " Gillbushes . . | 15 | 1269 | 20 19 3½ | 300 | 2 19 8½ | 23 19 0 | 16 2 11½ | 7 16 0½ | ... | ... | ... | Oats | 5 |
| 6 | " Bore Hole . . | 10½ | 1015 | 18 11 2¾ | 360 | 3 14 2½ | 22 5 5½ | 19 19 10½ | 2 5 7 | ... | ... | ... | Hay | 6 |
| 7 | " Beaty's Croft . . | 15¾ | 774 | 13 7 1 | 252 | 2 17 0 | 16 4 1 | 14 18 9½ | 1 5 3½ | ... | ... | ... | Grass | 7 |
| 8 | Average of 1868 . . | 16½ | 324½ | 6 13 6 | 374 | 4 1 5 | 10 14 11 | 13 3 8¾ | ... | ... | ... | 2 8 9¾ | ... | 8 |
| 9 | " 1869 . . | 38½ | 608½ | 12 10 0½ | 304 | 3 8 0½ | 15 18 1 | 16 9 4½ | ... | ... | ... | 0 11 3½ | ... | 9 |
| 10 | " 1870 . . | 66½ | 967½ | 16 9 9¾ | 297½ | 3 5 5¾ | 19 15 3½ | 17 9 0½ | 2 6 3 | ... | ... | ... | ... | 10 |
| 11 | " 1871 . . | 99½ | 284¾ | 5 5 4½ | 473 | 2 19 2 | 8 4 6½ | 16 5 2½ | ... | ... | ... | 8 0 8 | ... | 11 |
| 12 | " 1868-71 . . | 221 | 546½ | 10 4 8½ | 362 | 3 8 6¼ | 13 13 2¾ | 15 16 10 | ... | ... | ... | 2 3 7½ | ... | 12 |

* In 1870, of the "Large-Potatoes" column, about 2-5ths of the returns are for potatoes sold unsorted.

The Potato Crop of East Wet-flat.

After 1868 the manure used was entirely chemical; and 14 cwt. (the usual quantity applied per acre) contained about 7 cwt. of superphosphate, 3 of sulphate of ammonia, $2\frac{3}{4}$ muriate of potash, $\frac{3}{4}$ salt, and $\frac{1}{2}$ cwt. gypsum.

Beginning with the first line of 1869, E. Wet-flat (Orchard) field gives the poorest return. The fault is not, however, in the weight, which is above the average of the year; but in the smaller proportion of large potatoes, and a lower average price, arising from deficiency in size. In looking for the cause of this, the first point that strikes one is the smallness of the charge in the seed column. The weight of seed planted per acre was 71 stones; while that of West-heads was 150. But on the other hand, Gillbushes No. 5, which had also the least seeding of its year (1870) gives the heaviest yield of its year. But East Wet-flat differs; in that the seed, besides being scanty, was also inferior. This field had been irrigated for many years previously, and frequently mown for green food; hence it was in a very dirty state; and though it was lightly steam grubbed in spring, the after-cleaning delayed the planting till May. But by this time the new seed obtained from Scotland was exhausted; and to plant this field all the odds and ends had to be cut small, and planted wide. Another disadvantage was the condition and character of the soil, which was rather too stiff in its nature for potatoes. Late planting might also have been blamed, but that Gillbushes resembles it in this respect also.

Our experience as regards the Potato crop is, upon the whole, favourable to early planting; Mid-heads, the best field of 1869, having been planted in February. But this question was long a moot one with us, and in 1869-70 was made the subject of an experiment on East-heads field. The results were at the time published in most of the agricultural papers. Planting was begun in October, and three drills were planted every month; the date of the last planting being May 9th. The sets were Regents, chiefly whole, and varying from $3\frac{1}{4}$ to $1\frac{1}{4}$ ounces in weight, $1\frac{3}{4}$ being the average; and were planted about 9 inches apart. They were sorted from one field's produce, and of a uniform size to insure equality of conditions. The plots, of three drills

Autumn Planting of Potatoes a failure.

each, were, just before planting, sown with a mixture consisting of superphosphate (mineral), 5 cwts.; muriate of potash, $2\frac{1}{4}$ cwts.; and sulphate of ammonia, $1\frac{3}{4}$ cwts. per acre. The March plot was first to turn yellow, then the February one; and after April, all the others ripened simultaneously, except May, which ripened last. All were raised, sorted, and weighed, Oct. 6, with the following results:—

TABLE I.—AUTUMN *versus* SPRING PLANTING OF POTATOES.

| Date when Planted. | Weather at time of Planting. | Weight per Acre. | Value per ton as raised. | | | Value per Acre. | | |
|--------------------|-----------------------------------|------------------|--------------------------|----|----|-----------------|----|----|
| 1869. | | tons. cwts. | £ | s. | d. | £ | s. | d. |
| Oct. 6..... | Mild and dry..... | 3 11 | 2 | 6 | 3 | 8 | 4 | 1 |
| Nov. 5..... | Cold winds and heavy showers..... | 5 1½ | 2 | 5 | 11 | 11 | 13 | 5 |
| Dec. 15..... | Cold and slight rains. | 5 8½ | 2 | 11 | 3 | 13 | 17 | 9 |
| 1870. | | | | | | | | |
| Jan. 12..... | Cold and damp.. | 6 6½ | 2 | 10 | 9 | 16 | 0 | 7 |
| Feb. 7..... | Frost and slight snow. | 9 5¼ | 2 | 9 | 3 | 22 | 16 | 2 |
| Mar. 7..... | Dry frost. | 9 10¼ | 2 | 8 | 0 | 22 | 16 | 7 |
| April 8..... | Warm... .. | 8 8 | 2 | 8 | 0 | 20 | 3 | 2 |
| May 9.. | Warm... .. | 9 1¼ | 2 | 8 | 5 | 21 | 18 | 9 |

In the January plot the misses were very numerous; the April sets were much sprouted; in May the seed in hand was insufficient, and this month's plot was planted with a mixed lot containing rocks; it cannot therefore be fairly compared with the others. The column "Value per ton as raised" is calculated from the weights of large, medium, and small, when hand-picked; the large being valued at $4\frac{1}{2}$ d. per stone, the medium at 3d., and pig-potatoes at 2d. These sizes are such as would be sorted by inch-and-half and inch-and-seven-eighths riddles. Excluding October and November, and also May because of its mixed seed, it will be seen that the best quality, *i.e.*, the highest value per ton, was produced by the seed longest in the land; December standing highest in this column, then January, February, &c. Thus February, though 5 cwt. per acre less in weight than March, is of almost equal money value per acre; because of its greater proportion of large potatoes, and consequently higher value per ton.

Cultivation of our Potato Land.

Autumn planting is here condemned, and the experience of 1869 is confirmed; February and early in March proving superior to any of either earlier or later planting. Frost, and even slight snow at the time of planting, seem also to have been in no way injurious.

Mid-heads, the second field, was the earliest planted; and, being the first trial on a large scale of the chemical potato manure, it was closely watched by some of the labourers, who were rather opposed to the innovation. The crop, though not the heaviest, is the most profitable (if all the potato land is valued as £3 per acre better),—the quality being very good: for, dividing the money returns by the weight in stones, we find that the Mid-heads potatoes sold about $5\frac{1}{4}$ d, but Wet-flat and West-heads only about $4\frac{1}{2}$ d. per stone. We also find 70·1 per cent. of the potatoes from Mid-heads saleable at this price; but only 58·6 from Wet-flat, and 67·2 from West-heads. This latter kind of comparison is of great value, a heavy crop of *small* potatoes being very unprofitable; each ton giving as much trouble, and taking as much from the land, whether the tubers are large or small, or whether they sell at £3 or £1 per ton. But this point will be considered presently, and the question investigated whether a lea stubble has anything to do with it or not.

This field, like most of our intended potato land, had been deeply steam-grubbed in autumn, and afterwards ridged up for the winter. In spring these drills were generally split and the manure sown on them; they were then harrowed down, and again ridged up with the double mould board plough; after which the seed was planted and covered in by re-splitting these drills. In 1870 the potatoes on East-heads and some other fields were planted in the drills which had stood over the winter, with the view of saving the time and labour of re-splitting them in spring. As an experiment, about a third of an acre was, however, first re-split: and when the crop was weighed in November against the next ten drills which had not been split, the former proved better in weight by $7\frac{1}{2}$ cwt. per acre, value about 15s., a sum much more than sufficient to pay for the extra labour.

The previous cropping of Mid-heads, as given in the

Wide Planting produces the Largest Potatoes.

Cropping list (page 225), shows this to have been the fourth green crop in seven years; and as all these had been well manured, the land was in good condition. Its further production will be found in the Wheat Cropping Sheet, No. 10.

West-heads, No. 3, gives the heaviest yield; but in quality and return it stands second, and in profit third. Looking at the various items of expenditure on it, the heavy charge for seed first takes the attention. The weight of seed was about 150 stones per acre, a quantity as much above the average as Wet-flat was below it. The cost of this seems the chief cause of its standing lowest in profit; probably it was heavily seeded as a farm experiment, but no note of the intention or result was made. Another experiment was also tried in this field, half an acre getting cattle manure; but the bailiff must have been satisfied with the appearance only, as the threatened discomfiture of the chemical manure was never heard of afterwards.

The year 1870 presents also some features of interest. Perhaps the first thing that attracts notice is, that a heavy seeded field (No. 4.) is again the worst paying one; evidently 125 stones per acre was beyond the paying quantity.

On this question of the most profitable seeding, the chemist tried nearly 70 experiments, which, but for pressing duties, would have appeared in this book. The results are not yet fully analysed, but this much may be said, that *the most profitable* seeding—taking into account the cost of seed—was 107 stones per acre, of small cut seed, planted 9-inches apart; but that *a heavier yield* per acre was obtained from 162 stones of seed. Also, that cut seed was not superior to whole potatoes, if the latter were planted as much further apart as would supply exactly the same weight per acre of seed. It was also found that wide planting produced the largest potatoes; and that medium-sized seed, say of 2 ounces weight, set about 12 or even fourteen inches apart, promised the best crop, quality being considered as well as quantity.

Gillbushes field, No. 5, will also attract attention; showing, as it does, a profit of £7 16s. ½d. per acre; or rather of £3 more, on account of the unexhausted manure and

Loss of Weight in Storing and Sorting Potatoes.

tillage, chargeable against the succeeding crops of the course. Its previous history at once explains this: four years of grass till 1869, then oats, and now potatoes; no wonder then if, with a good season, and over 16 cwts. per acre of potato manure, it yields 9 tons, 16 cwts., and 14 lbs. per acre. As weighed into the pits, the weight was 9 tons, 19 cwts., and 97 lbs.: but there is always a loss in storing; and a trial of this year with 1,980 stones pitted in November, and weighed out after about 170 days, showed a loss of about 242 stones, equal to 12.2 per cent., or 2 cwts. and 50 lbs. out of every ton. This loss was much less where the potatoes were not kept till spring; for the loss between the field and the selling weight of the 577½ tons of this year was only 29 tons, 14 cwts. But, seeing that 158½ tons of this were sold unsorted, and that the loss of weight must have occurred chiefly in the sorting, let us deduct this 158½ tons. This, then, shows a loss, in the sorting and selling of 419 tons, of 7.1 per cent., or 1 cwt. 47 lbs. out of every ton.

Borehole, No. 6, is the next field in point of profit. It received an excessive manuring, getting nearly 21 cwts. per acre of potato manure. About half of the field was very poor, having come into our hands only this year; but even in view of this, the manuring was excessive, and told upon the flavour of the potatoes. They, however, improved with keeping; and the larger part of the crop was sold in February, at the highest price of that year.

Beaty's Croft, No. 7, which gives the poorest return in weight and value—though not in profit—was also a field just acquired this year; it also was in poor condition, and might, with advantage to both, have received some of the Borehole field's manure. It underwent much cultivation; getting, besides the usual grubbing, four steam harrowings, and one harrowing by the horses; it shows, notwithstanding, a less costly cultivation than Borehole, which must have been steam-grubbed more deeply.

The proportion of large potatoes is, on this and Borehole field, above the average; which, coupled with the fact that in 1869 Mid-heads was also highest in this respect, suggests the conclusion that grass, the preceding crop in all three

Potatoes grown in a Lea Stubble have the largest Tubers.

cases, had something to do with it. The proportion of large potatoes has been obtained by taking the weights of the large and the pig-potatoes, and calculating from these the per centages. In 1870 the sales of unsorted potatoes are included in the "large potatoes" column; deducting these, the nett weights of large potatoes were, for No. 4, 513 stones; No. 5, 521; No. 6, 783; and No. 7, 646½: calculating, then, from these, the per centages, and comparing Nos. 2, 6, and 7, which had grass or hay as the preceding crop, with Nos. 1, 3, 4, and 5, which were preceded by oats, we find the former superior in every case. This will be better seen in the following table.

TABLE II.—PER CENT. OF LARGE POTATOES IN THE GROSS WEIGHTS, WHEN THIS CROP IS GROWN AFTER GRASS AND AFTER OATS RESPECTIVELY.

| After Grass. | | After Oats. | |
|---------------|-----------|-------------|----------------|
| 70·1 | per cent. | ... | 58·0 per cent. |
| 68·5 | " | ... | 67·2 " |
| 72·0 | " | ... | 63·2 " |
| — | " | ... | 63·5 " |
| <hr/> | | <hr/> | |
| Average, 70·2 | " | ... | 63·0 " |

The difference in favour of planting after grass, as compared with oats, is 7·2 per cent., which, on a weight of six tons per acre (the large potatoes selling at 4½d. and the small at 1½d. per stone), would amount to a difference of 17s. 6d. per acre; the gross weights, of course, remaining the same. The weight, however, was always less also on the after-lea fields, the deficiency on the above averaging 23 cwts. per acre. But this cannot be entirely attributed to the preceding crop—Gillbushes having special causes for its superiority, as also Beaty's Croft for its inferiority. But, even leaving out these two fields, our experience is, *that, taken after grass, the potato crop is generally lighter, but of better quality*; and as the evidence for the "better quality" is much the surer, I should be inclined to

Potato Drills one Yard in width prove the most profitable.

value the lea stubble as worth at least 10s. per acre to a subsequent potato crop.

Increase in the width of intervals between the sets has also been referred to as producing larger potatoes; and naturally one would expect wide drills to have the same effect. The following experiments were tried on this latter point in 1869 and 1871 :—

TABLE III.—EXPERIMENTS AS TO THE BEST WIDTH OF POTATO DRILLS.

| Size of Drill. | Large Potatoes, p. cent. | | Seed, per Acre. | | Weight of Potatoes, per Acre. | | Value of Crop, deducting Cost of Seed. | | Avg. of both Yrs., less Cost of Seed. |
|----------------|--------------------------|-------|-----------------|--------|-------------------------------|----------|--|----------|---------------------------------------|
| | 1869. | 1871. | 1869. | 1871. | 1869. | 1871. | 1869. | 1871. | |
| Inches. | | | Stones | Stones | T. C. Lb | T. C. Lb | £ s. d. | £ s. d. | £ s. d. |
| 18 | 43·2 | | 180 | | 8 6 96 | | 15 6 6 | | |
| 24 | 40·7 | 45·4 | 135 | 151½ | 7 0 110 | 7 3 71 | 13 3 0 | 12 16 4 | 12 19 8 |
| 27 | | 44·4 | | 135¾ | | 6 6 84 | | 11 2 7 | |
| 30 | 49·3 | 52·7 | 108 | 121¼ | 6 8 38 | 6 11 29 | 12 19 0 | 12 15 10 | 12 17 5 |
| 33 | | 56·1 | | 110¼ | | 5 14 45 | | 11 2 10 | |
| 36 | 61·5 | 56·0 | 90 | 101¼ | 6 19 73 | 5 19 72 | 15 15 2 | 12 14 1½ | 14 4 8 |

The final averages are here in favour of a drill of 36 inches; for, excluding the 18, 27, and 33 inches' experiments as supplying only one year's data, we find the heaviest weight always in the narrow 24-inch drills; but the greatest proportion of large or high-priced potatoes in the widest, or 36-inch drills; and, balancing these two advantages, the wide drills stand the highest. The proof is not, however, quite satisfactory; for the 1871 experiments were tried on a much larger scale than those of 1869, and each item of 1871 is the average of two plots placed at some distance from each other. And seeing, too, that the results from 27 and 33 inches are so contradictory to the others, further experiment is very necessary to decide the question.

Returning again to the Cropping Sheet, the yearly averages call for attention. The year 1870 shows itself in every respect the best season, as is easily seen on arranging the years together, and adding to the profit per acre £3, for unexhausted manure and tillage.

Effects of the Disease on different varieties of Potatoes.

TABLE IV.—COMPARISON OF THE POTATO CROP RETURNS OF FOUR SEASONS.

| Year. | Weight per Acre. | | | Per Cent. of Large Potatoes. | Average price per Cwt. | Profit per acre. | | |
|-------|------------------|-------|------|------------------------------------|---------------------------|------------------|----|----|
| | Tons. | Cwts. | Lbs. | | | | | |
| 1868. | 4 | 7 | 35 | 46·5 | 3s. 3¼d. | £0 | 11 | 2¼ |
| 1869. | 5 | 14 | 7 | 66·7 | 3s. 3½d. | 2 | 8 | 8½ |
| 1870. | 7 | 18 | 14 | 66·4 | 3s. | 5 | 6 | 3 |
| 1871. | 4 | 14 | 80 | 37·6 | 2s. 11½d. | ... | | |
| Avg. | 5 | 13 | 66 | 54·3 | 3s. 1½d. | 0 | 16 | 4¾ |

1871 would stand at a loss per acre of £5 os. 8d., because of the disease; there being 296 tons diseased out of a total weight of 474 tons. There were, however, very great differences in this respect, both between the fields and the different varieties of potatoes. The Regents, or rough whites, stood thus—

| | | | |
|-----------------------------|-----|------|---------------------|
| After Oats, Longlands field | had | 65·4 | per cent. diseased. |
| „ Oats, Moss | „ | 69·2 | „ „ |
| „ Oats, Fitz | „ | 78·7 | „ „ |
| „ Grass, Festival | „ | 71·3 | „ „ |

Preceding crop seems thus to have had little effect; the only noteworthy feature being that the hardest cropped field, Longlands, shows the least disease,—giving also, as it did, by 3 cwts. per acre the heaviest crop. As for the differences between varieties, they stand as follows :—

Regents were 70·6 per cent. diseased.

Rocks were 29·7 per cent. diseased.

Skerries showed very little disease.

Without this year's experience, our potato cropping facts would have been very incomplete; and instead of an annual profit of 16 shillings per acre, as the average of 221 acres, we should have shown £2 15s. 4½d. over 121½ acres. Even with this low rate of profit, potatoes, as a green crop, were preferred to Swedes; the latter always proving very unprofit-

Swede Turnip Cropping Sheet.

No. 9.—SWEDE TURNIPS AND TARES.—THREE YEARS' RESULTS PER ACRE.

[illegible]

Thirty-six Shillings Loss per acre per annum by Potato Disease.

able, as Cropping Sheet No. 9 (p. 274) will show. Potatoes were, however, less cleaning to the land, and much more risky; but, even placing this year of disease against the three good ones of potatoes, Swedes show a much lower average return per acre.

If the four years, 1868 to 1872 inclusive, present a fair average of seasons and risks for potatoes, our figures show this risk of disease as 11·7 per cent. This is obtained by crediting each of the four years with an income of £15 9s. 5d. per acre (the average of the three good years), and then calculating the deficiency of 1871 (£7 4s. 10½d.) from this average, as risk on £61 17s. 8d. (four times £15 9s. 5d.). So taken, the risk stands at 11·7 per cent., and equals £1 16s. 2½d. per acre, or a tax of 2s. 4d. in the £.

9. SWEDE TURNIPS, Cropping Sheet No. 9, show a loss all through; the final average, No. 7, showing from three years (and 74¾ acres) a loss of £5 6s. 3¼d. per acre;—reduced, however, to about £2 when the unexhausted manure and tillage is valued against the succeeding crops of the course. (See page 274.)

The cost of cultivation of this crop may seem excessive, but Mr. Lawson believed in deep cultivation for root crops; and in the autumn of 1868 the land was deeply steam-grubbed—four of the seven tines of the grubber being removed, so that all the engine power was concentrated on three tines. Of course the cost of this was heavy, being £2 12s. per acre. The land was then stitched up, so that a large surface was exposed to the winter frosts.

The hot, dry summer of 1868 told all over England, making the turnip fields like fallow-land; but our early sowing ensured us a partial crop: and, some of the roots being sold at 33s. a ton, this year stands about equal with the others. Most of the 1868 crop was carted home and stored in pits, in anticipation of a good spring demand; but 61¾ tons, after lying till April, realised only 8s. per ton for sheep on the fog.

In 1869 we had fair crops; West-heads, No. 3, testing about 27 tons per acre, and Mire-ing, No. 1, about 20. A

A Field Three Years under Wheat.

few tons were taken home and eaten by sheep on the fog, the price charged being 8s. a ton; but by far the largest portion of the crop (at least seven-eighths) were eaten on the land by lambs at 4½d. per head per week. The returns for this are very low, and led us latterly to prefer potatoes, cabbages, carrots, or anything to Swede turnips whenever a green crop was to be grown. The seed used was chiefly Sutton's Champion.

On Swedes we tried many experiments, which cannot at present be given. Cattle manure gave the heaviest yield of them, but not the most profitable crop; this having been grown by 3 cwts. superphosphate, 2 cwts. muriate of potash, and 1 cwt. sulphate of ammonia.

10. THE WHEAT CROP, on Cropping Sheet No. 10, is one of the most instructive. For, as in science far more is learned by failures than successes, so, in farming, the exact record of failures does most for a correct knowledge of the true conditions of success. In this crop we have the two extremes of profit and loss: for, valuing the after condition of the land, it shows (in No. 9) the highest profit, and (in No. 5) the heaviest loss experienced in all our cropping.

Beginning with 1869, No. 2, C. Wet-flat shows least profit. A reference to its previous history shows it to have been also under wheat in 1868, and that this is its second wheat crop; and it again appears, in No. 5, a third year under wheat, showing a heavy loss. These three wheat crops were tried partly as an experiment, but chiefly to get the three parts of this field all under one crop and into a kind of rotation. In 1867 it was under four different crops; but after the Cropping Sheet system of accounts was adopted, an effort was made to crop each large field as a whole. The second wheat crop, 1869, had about 10 cwts. per acre of wheat manure, half applied in autumn and half in spring.

But even with this quantity of manure its yield is surpassed by Longlands, No. 3, a field rather over-cropped, but just out of potatoes which had been manured with both cattle and chemical manure. Longlands field had all its manure in the spring, and then only about 3 cwts. per

Severity of Wheat—it prevents Soil Aeration.

acre of wheat manure; it shows the highest profit of the three fields of 1869, chiefly because it cost less than the other two for cultivation and manure, and partly from the superior quality of both its grain and straw, which sold at the highest prices; the grain selling at 21s. 10d. per 13 stones, a price 1s. 2d. above the average of the year.

Gillgooden field gives the best yield, but not the highest profit. The cultivation was costly, the land being grubbed out of lea in the autumn by steam power, which also gave it six of the eleven harrowings. This field was of a stiff nature suitable for wheat, and the cropping list shows wheat, hay, wheat, hay, and wheat as the cropping for 1867 to 1872; a rotation which does not seem to have been a good one, as will presently be seen.

1870 presents striking contrasts, No. 4 showing over £11 profit, and No. 5 over £2 loss per acre. Taking the failures first, as being the more instructive, No. 5 will be recognised as the field of three successive wheat crops. A glance at the manure column shows an attempt to meet this case; 50 tons of cattle manure were applied, being at the rate of 8 tons per acre; it had, besides, $3\frac{1}{2}$ cwts. of wheat manure in autumn, and 7 cwts. in spring; the whole costing over £7 per acre. But nothing can make up for that aeration of the soil which spring cultivation alone can give, and which the ordinary wheat crop always prevents. This is probably the main cause of the severity of a wheat crop; since it removes from the land but little more than a crop of oats or barley; its roots, too, going so deep during the long winter's rest, in reality it exhausts the surface soil less than a crop of barley. But the airing of the soil in spring, when all nature is alive, and growth is in every breeze, promotes the formation of ammonia in the soil, and the release of insoluble fertilising matters. Hence the success of Smith of Lois-Weedon, who grew his wheat without manure, by sowing it in wide rows, and cultivating the soil between. But this question requires more experiment and study, and must at present be left an open question.

West Wet-flat, No. 6, gives a return even poorer than the third wheat crop of No. 5. In rotation it differs from No.

Wheat Cropping Sheet—Outlay per Acre.

No. 10.—WHEAT CROPS, 1867-8-9 AND 1870.—OUTLAY PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Grubbed. | Ploughed. | Harrowed. | Rolled. | Cultiva- tion. | Seed. | Manure. | Harvest- ing. | Housing. | Thrash- ing. | Delivery. | Total Outlay. | No. |
|-----|-------------------------|----------|----------|-----------|-----------|---------|---|---|---|---|---|---|---|--|-----|
| 1 | 1869, Gillgooden | 23 | 3 | 1 | 11 | 1 | £ s. d. £ s. d. £ s. d. £ s. d. £ s. d. £ s. d. £ s. d. £ s. d. £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | | |
| 2 | " C. Wet Flat | 6½ | .. | 1 | 3 | 1 | 3 6 0½ 1 2 0¾ 3 6 5¼ 0 12 2¾ 0 14 5½ 0 14 6 0 3 9¾ | 1 3 6 0½ 1 2 0¾ 3 6 5¼ 0 12 2¾ 0 14 5½ 0 14 6 0 3 9¾ | 1 3 6 0½ 1 2 0¾ 3 6 5¼ 0 12 2¾ 0 14 5½ 0 14 6 0 3 9¾ | 1 3 6 0½ 1 2 0¾ 3 6 5¼ 0 12 2¾ 0 14 5½ 0 14 6 0 3 9¾ | 1 3 6 0½ 1 2 0¾ 3 6 5¼ 0 12 2¾ 0 14 5½ 0 14 6 0 3 9¾ | 1 3 6 0½ 1 2 0¾ 3 6 5¼ 0 12 2¾ 0 14 5½ 0 14 6 0 3 9¾ | 1 3 6 0½ 1 2 0¾ 3 6 5¼ 0 12 2¾ 0 14 5½ 0 14 6 0 3 9¾ | 1 3 6 0½ 1 2 0¾ 3 6 5¼ 0 12 2¾ 0 14 5½ 0 14 6 0 3 9¾ | |
| 3 | " Longlands. | 15 | .. | 1 | 3 | 1 | 1 5 10 1 2 1 3 19 10½ 0 8 7¼ 0 14 4 0 10 8½ 0 4 9½ | 1 5 10 1 2 1 3 19 10½ 0 8 7¼ 0 14 4 0 10 8½ 0 4 9½ | 1 5 10 1 2 1 3 19 10½ 0 8 7¼ 0 14 4 0 10 8½ 0 4 9½ | 1 5 10 1 2 1 3 19 10½ 0 8 7¼ 0 14 4 0 10 8½ 0 4 9½ | 1 5 10 1 2 1 3 19 10½ 0 8 7¼ 0 14 4 0 10 8½ 0 4 9½ | 1 5 10 1 2 1 3 19 10½ 0 8 7¼ 0 14 4 0 10 8½ 0 4 9½ | 1 5 10 1 2 1 3 19 10½ 0 8 7¼ 0 14 4 0 10 8½ 0 4 9½ | 1 5 10 1 2 1 3 19 10½ 0 8 7¼ 0 14 4 0 10 8½ 0 4 9½ | |
| 4 | 1870, E. Wet Flat | 8½ | .. | 1 | 4 | 1 | 0 18 2½ 0 14 6 4 12 2 0 9 9½ 0 12 2 0 17 6 0 5 1¼ | 0 18 2½ 0 14 6 4 12 2 0 9 9½ 0 12 2 0 17 6 0 5 1¼ | 0 18 2½ 0 14 6 4 12 2 0 9 9½ 0 12 2 0 17 6 0 5 1¼ | 0 18 2½ 0 14 6 4 12 2 0 9 9½ 0 12 2 0 17 6 0 5 1¼ | 0 18 2½ 0 14 6 4 12 2 0 9 9½ 0 12 2 0 17 6 0 5 1¼ | 0 18 2½ 0 14 6 4 12 2 0 9 9½ 0 12 2 0 17 6 0 5 1¼ | 0 18 2½ 0 14 6 4 12 2 0 9 9½ 0 12 2 0 17 6 0 5 1¼ | 0 18 2½ 0 14 6 4 12 2 0 9 9½ 0 12 2 0 17 6 0 5 1¼ | |
| 5 | " C. Wet Flat | 6½ | .. | 1 | 4 | 1 | 1 10 2½ 0 14 8 7 6 2 0 10 0¼ 0 14 10½ 0 13 5¾ 0 4 11 9 9 | 1 10 2½ 0 14 8 7 6 2 0 10 0¼ 0 14 10½ 0 13 5¾ 0 4 11 9 9 | 1 10 2½ 0 14 8 7 6 2 0 10 0¼ 0 14 10½ 0 13 5¾ 0 4 11 9 9 | 1 10 2½ 0 14 8 7 6 2 0 10 0¼ 0 14 10½ 0 13 5¾ 0 4 11 9 9 | 1 10 2½ 0 14 8 7 6 2 0 10 0¼ 0 14 10½ 0 13 5¾ 0 4 11 9 9 | 1 10 2½ 0 14 8 7 6 2 0 10 0¼ 0 14 10½ 0 13 5¾ 0 4 11 9 9 | 1 10 2½ 0 14 8 7 6 2 0 10 0¼ 0 14 10½ 0 13 5¾ 0 4 11 9 9 | 1 10 2½ 0 14 8 7 6 2 0 10 0¼ 0 14 10½ 0 13 5¾ 0 4 11 9 9 | |
| 6 | " W. Wet Flat | 10¼ | 2 | 1 | 8 | 1 | 2 16 5¼ 0 14 10¾ 5 1 8½ 0 10 8 0 8 7½ 0 11 1½ 0 6 10 3 11½ 6 | 2 16 5¼ 0 14 10¾ 5 1 8½ 0 10 8 0 8 7½ 0 11 1½ 0 6 10 3 11½ 6 | 2 16 5¼ 0 14 10¾ 5 1 8½ 0 10 8 0 8 7½ 0 11 1½ 0 6 10 3 11½ 6 | 2 16 5¼ 0 14 10¾ 5 1 8½ 0 10 8 0 8 7½ 0 11 1½ 0 6 10 3 11½ 6 | 2 16 5¼ 0 14 10¾ 5 1 8½ 0 10 8 0 8 7½ 0 11 1½ 0 6 10 3 11½ 6 | 2 16 5¼ 0 14 10¾ 5 1 8½ 0 10 8 0 8 7½ 0 11 1½ 0 6 10 3 11½ 6 | 2 16 5¼ 0 14 10¾ 5 1 8½ 0 10 8 0 8 7½ 0 11 1½ 0 6 10 3 11½ 6 | | |
| 7 | " Mid Heads. | 17¾ | .. | 1 | 4 | 1 | 0 18 10½ 0 15 10¼ 4 10 11¼ 0 11 2½ 0 11 4½ 0 13 0 0 2 1 8 3 4 7 | 0 18 10½ 0 15 10¼ 4 10 11¼ 0 11 2½ 0 11 4½ 0 13 0 0 2 1 8 3 4 7 | 0 18 10½ 0 15 10¼ 4 10 11¼ 0 11 2½ 0 11 4½ 0 13 0 0 2 1 8 3 4 7 | 0 18 10½ 0 15 10¼ 4 10 11¼ 0 11 2½ 0 11 4½ 0 13 0 0 2 1 8 3 4 7 | 0 18 10½ 0 15 10¼ 4 10 11¼ 0 11 2½ 0 11 4½ 0 13 0 0 2 1 8 3 4 7 | 0 18 10½ 0 15 10¼ 4 10 11¼ 0 11 2½ 0 11 4½ 0 13 0 0 2 1 8 3 4 7 | 0 18 10½ 0 15 10¼ 4 10 11¼ 0 11 2½ 0 11 4½ 0 13 0 0 2 1 8 3 4 7 | | |
| 8 | Average of 1867. | 22½ | .. | .. | .. | .. | 0 17 7 1 6 0 2 10 0 1 8 6 .. 0 19 0 0 1 6 7 2 7 8 | 0 17 7 1 6 0 2 10 0 1 8 6 .. 0 19 0 0 1 6 7 2 7 8 | 0 17 7 1 6 0 2 10 0 1 8 6 .. 0 19 0 0 1 6 7 2 7 8 | 0 17 7 1 6 0 2 10 0 1 8 6 .. 0 19 0 0 1 6 7 2 7 8 | 0 17 7 1 6 0 2 10 0 1 8 6 .. 0 19 0 0 1 6 7 2 7 8 | 0 17 7 1 6 0 2 10 0 1 8 6 .. 0 19 0 0 1 6 7 2 7 8 | 0 17 7 1 6 0 2 10 0 1 8 6 .. 0 19 0 0 1 6 7 2 7 8 | | |
| 9 | " 1868. | 26½ | .. | .. | .. | .. | 1 2 2¾ 0 19 7 1 12 5¼ 0 18 2½ .. 0 6 9½ 4 19 3½ 9 | 1 2 2¾ 0 19 7 1 12 5¼ 0 18 2½ .. 0 6 9½ 4 19 3½ 9 | 1 2 2¾ 0 19 7 1 12 5¼ 0 18 2½ .. 0 6 9½ 4 19 3½ 9 | 1 2 2¾ 0 19 7 1 12 5¼ 0 18 2½ .. 0 6 9½ 4 19 3½ 9 | 1 2 2¾ 0 19 7 1 12 5¼ 0 18 2½ .. 0 6 9½ 4 19 3½ 9 | 1 2 2¾ 0 19 7 1 12 5¼ 0 18 2½ .. 0 6 9½ 4 19 3½ 9 | 1 2 2¾ 0 19 7 1 12 5¼ 0 18 2½ .. 0 6 9½ 4 19 3½ 9 | | |
| 10 | " 1869. | 44¼ | .. | .. | .. | .. | 2 6 8½ 1 2 1 2 14 2¼ 0 11 6 0 12 11½ 0 14 3¼ 0 4 1¼ 8 5 9¾ 10 | 2 6 8½ 1 2 1 2 14 2¼ 0 11 6 0 12 11½ 0 14 3¼ 0 4 1¼ 8 5 9¾ 10 | 2 6 8½ 1 2 1 2 14 2¼ 0 11 6 0 12 11½ 0 14 3¼ 0 4 1¼ 8 5 9¾ 10 | 2 6 8½ 1 2 1 2 14 2¼ 0 11 6 0 12 11½ 0 14 3¼ 0 4 1¼ 8 5 9¾ 10 | 2 6 8½ 1 2 1 2 14 2¼ 0 11 6 0 12 11½ 0 14 3¼ 0 4 1¼ 8 5 9¾ 10 | 2 6 8½ 1 2 1 2 14 2¼ 0 11 6 0 12 11½ 0 14 3¼ 0 4 1¼ 8 5 9¾ 10 | 2 6 8½ 1 2 1 2 14 2¼ 0 11 6 0 12 11½ 0 14 3¼ 0 4 1¼ 8 5 9¾ 10 | | |
| 11 | " 1870. | 42¾ | .. | .. | .. | .. | 1 9 5 0 15 2½ 5 1 10 0 10 7½ 0 11 4¾ 0 13 6 0 2 0½ 9 4 0 11 | 1 9 5 0 15 2½ 5 1 10 0 10 7½ 0 11 4¾ 0 13 6 0 2 0½ 9 4 0 11 | 1 9 5 0 15 2½ 5 1 10 0 10 7½ 0 11 4¾ 0 13 6 0 2 0½ 9 4 0 11 | 1 9 5 0 15 2½ 5 1 10 0 10 7½ 0 11 4¾ 0 13 6 0 2 0½ 9 4 0 11 | 1 9 5 0 15 2½ 5 1 10 0 10 7½ 0 11 4¾ 0 13 6 0 2 0½ 9 4 0 11 | 1 9 5 0 15 2½ 5 1 10 0 10 7½ 0 11 4¾ 0 13 6 0 2 0½ 9 4 0 11 | 1 9 5 0 15 2½ 5 1 10 0 10 7½ 0 11 4¾ 0 13 6 0 2 0½ 9 4 0 11 | | |
| 12 | " 1868-9-70. | 113½ | .. | .. | .. | .. | 1 12 9½ 0 18 11½ 3 2 10 0 13 5 0 12 2½ 0 11 6¼ 0 3 1 7 9 8½ 12 | 1 12 9½ 0 18 11½ 3 2 10 0 13 5 0 12 2½ 0 11 6¼ 0 3 1 7 9 8½ 12 | 1 12 9½ 0 18 11½ 3 2 10 0 13 5 0 12 2½ 0 11 6¼ 0 3 1 7 9 8½ 12 | 1 12 9½ 0 18 11½ 3 2 10 0 13 5 0 12 2½ 0 11 6¼ 0 3 1 7 9 8½ 12 | 1 12 9½ 0 18 11½ 3 2 10 0 13 5 0 12 2½ 0 11 6¼ 0 3 1 7 9 8½ 12 | 1 12 9½ 0 18 11½ 3 2 10 0 13 5 0 12 2½ 0 11 6¼ 0 3 1 7 9 8½ 12 | 1 12 9½ 0 18 11½ 3 2 10 0 13 5 0 12 2½ 0 11 6¼ 0 3 1 7 9 8½ 12 | | |

Wheat Cropping Sheet—Yield, Profits, and Losses.

No. 10.—WHEAT CROPS, 1867-8-9 AND 1870.—RETURN AND BALANCE PER ACRE.

| No. | YEAR AND NAME OF FIELD. | Acreage. | Good Wheat. | | Hinder-ends. | | Straw. | | Total Return. | Total Outlay. | Profit. | Loss. | Preced- ing Crop | No. |
|-----|-------------------------|----------|-------------|---------|--------------|---------|--------|----------|---------------|---------------|----------|---------|---------------------|-----|
| | | | Bush. | £ s. d. | Bush. | £ s. d. | Stones | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | | |
| 1 | 1869, Gillgooden | 23 | 26½ | 9 4 10 | 2¼ | 0 5 6 | 241½ | 3 6 6 | 12 16 10 | 9 19 6½ | 2 17 3½ | 5 | Hay | 1 |
| 2 | " C. Wet Flat | 6½ | 19½ | 6 9 2½ | 5½ | 0 16 6½ | 204 | 2 15 9½ | 10 1 6½ | 8 6 2½ | 1 15 3½ | .. | Wheat | 2 |
| 3 | " Longlands | 15 | 23½ | 8 9 3 | 3½ | 0 5 1½ | 200 | 2 18 0½ | 11 12 5½ | 5 13 10½ | 5 18 6½ | .. | Potatoes | 3 |
| 4 | 1870, E. Wet Flat | 8½ | 43½ | 16 2 11 | 1 | 0 3 7½ | 294 | 3 12 10½ | 19 19 4½ | 8 9 5½ | 11 9 11½ | .. | Potatoes | 4 |
| 5 | " C. Wet Flat | 6½ | 14 | 5 16 0 | 2 | 0 6 3½ | 276 | 2 17 9½ | 9 0 0¾ | 11 9 9 | .. | 2 9 8½ | Wheat | 5 |
| 6 | " W. Wet Flat | 10½ | 12½ | 5 3 9 | 1¼ | 0 4 3½ | 198½ | 2 12 1½ | 8 0 2 | 10 3 11½ | .. | 2 3 9½ | Hay | 6 |
| 7 | " Mid Heads | 17½ | 24 | 8 10 6¼ | 2¼ | 0 5 10½ | 315 | 3 15 7½ | 12 12 0 | 8 3 4 | 4 8 8 | .. | Potatoes | 7 |
| 8 | Average of 1867 | 22½ | .. | .. | .. | .. | .. | .. | 16 0 0 | 7 2 7 | 8 17 5 | .. | .. | 8 |
| 9 | " 1868 | 26½ | 41½ | 13 17 9 | .. | .. | 245 | 3 14 1 | 17 11 10 | 4 19 3½ | 12 12 6½ | .. | .. | 9 |
| 10 | " 1869 | 44½ | 24½ | 8 11 8½ | 2¾ | 0 6 11 | 222½ | 3 2 1½ | 12 0 9 | 8 5 9¾ | 3 14 11½ | .. | .. | 10 |
| 11 | " 1870 | 42¾ | 23½ | 8 16 10 | 1¾ | 0 5 1½ | 277 | 3 6 10 | 12 8 9½ | 9 4 0 | 3 4 9½ | .. | .. | 11 |
| 12 | " 1868-9-70 | 113½ | 30 | 10 8 9 | .. | .. | 248 | 3 7 8 | 14 0 5½ | 7 9 8½ | 6 10 9 | .. | .. | 12 |

Eleven Pounds Profit per Acre on East Wet-Flat.

5, only in hay taking the place of the second wheat crop; as, like No. 5, it was also under wheat in 1868. We tried this kind of two-course rotation on two fields, but not with good results. This field when under hay in 1869 (see No. 3 field, No. 5 cropping sheet) had less than half the manure of No. 5, and had this year less manure also, by over £2 per acre. Weighted even by these odds, No. 6 might have been expected to yield more than the field in a third wheat crop, but it did not, the loss column alone merely showing it not so bad as No. 5.

Looking now at the successes of 1870; East Wet-flat, No. 4 (another portion of the same field), stands highest, and considerably so; for in the "Total Return" column it has no equal, standing as it does at close upon £20 per acre, and this, too, over 8½ acres, landlord's measure. The previous history of this field was:—four years under irrigated grass, then a poor crop of oats in 1868, a poor one of potatoes in 1869, and now in 1870 a first-class crop of wheat. The soil, as has been before remarked, was one of our heaviest, though far from being a clay soil. It was not suited for potatoes, but the £5 per acre of manure applied for that crop has told upon the wheat. Of manure for wheat, it had about 4½ cwt. in autumn and 5 in spring. Financially it might have been shown much better, but that the crop was thrashed soon after harvest, and most of the corn sold in February at 21s. per 14 stones (196 lbs); only a few bushels of it being sold in summer, when 25s. were obtained for much of the corn from fields 5 and 6.

Mid Heads, No. 7, is another of the successes of 1870. It gave a very fair crop, though not equal to that of No. 4. The soil was lighter; the Heads being a gravel hill, consisting largely of a "shivery sandstone." For the previous potato crop it had rather more manure than No. 4, but gave also a much heavier crop. For the wheat, the manure was very much the same; and difference of soil seems to be the only reason for its yielding 18½ bushels per acre less than No. 4. Some attributed this deficiency to the deep steam grubbing which Mid Heads had in the autumn of 1868 for the potato crop (No. 4 receiving

Rotation Teachings of our Wheat Crops.

only a light steam grubbing in spring); but difference of soil and position is the more evident reason, the Mid Heads being much more exposed.

Having now considered each field by itself, it may be well to compare their returns as affected by rotation, &c. Both 1869 and 1870 furnish examples with three different preceding crops—hay, wheat, and potatoes. Where hay was the preceding crop, it had in both instances been preceded by wheat, a fact which should be borne in mind; as wheat after hay, in a proper rotation, might be expected to show a better result.

TABLE V.—PRODUCE OF WHEAT AFTER VARIOUS CROPS.

| | Produce per Acre. | Grain to every 100 lbs. of Straw. |
|---------------------------------|----------------------|--------------------------------------|
| Wheat grown after potatoes, ... | 28·6 bush. | ... 51·5 lbs. |
| „ „ hay, ... | 19·5 „ | ... 38·4 „ |
| „ „ wheat, ... | 16·6 „ | ... 32·3 „ |

This shows the wheat grown after potatoes superior in every respect; the average of two years giving 28·6 imperial bushels per acre, and showing the straw not quite twice the grain. After hay (preceded by wheat) the yield is much poorer, being only 19·5 bushels, and the straw is nearly three times the grain. This two-course rotation it will also be remembered, was found to be the worst for hay. But a yet worse rotation is wheat. After wheat the two trials, Nos. 2 and 5, averaged only 16·6 bushels, and the straw was more than three times the weight of the grain. This field, central Wet-flat, it will be remembered, was three years under wheat; and if we assume its return in 1868 to have been as good as the average, its three crops compare as follows:—

TABLE VI.—PRODUCE OF THREE SUCCESSIVE WHEAT CROPS ON CENTRAL WET-FLAT FIELD.

| | Produce per Acre. | Grain to every 100 lbs. of Straw. |
|-----------------------|----------------------|--------------------------------------|
| First Crop, 1868, ... | 41½ bush. | ... 73·4 lbs. |
| Second „ 1869, ... | 19¼ „ | ... 40·8 „ |
| Third „ 1870, ... | 14 „ | ... 23·7 „ |

Acreage Yield and Profits of the Wheat Crop for Three Years.

The season of 1868 being unusually favourable, the contrast is more striking than perhaps it would otherwise have been; and the first crop exceeds the second fully twice, and the third nearly three times, in its yield of corn. But the proportion of grain to straw, except in the third season, is not very different from the *general* average of each year. In the third season, however, it is very low, the average proportion in 1870 being 39·6, but from this third crop only 23·7; the straw being thus about four times the weight of the grain.

Turning our attention now to the average returns for the different years, 1868 is seen at once to be vastly superior to the others. The hot dry summer of that year was extremely favourable for wheat, and the profit shown of £12 12s. 6½d. per acre is thoroughly reliable. 1867 stands next in point of profit; but it cannot now be said whether the estimate (for 1867 is only an estimate) was founded upon some actual test of that year or not. 1869 and 1870 stand very much alike; in both years the worm affected the ears very much; and some fields promising well, yielded only poor returns when thrashed. This was especially the case in 1870, W. Wet-flat being very badly affected. Comparing the annual returns in kind, in money and quality, the various years stand as below:—

TABLE VII.—WHEAT CROP COMPARISONS FOR 1868, 1869, AND 1870.

| Year. | Acreage. | Bushels of Wheat per acre. | Average price ob- tained per bushel. | Stones of Straw per acre. | Grain to every 100 lbs. of Straw. | Profit per acre. |
|-------|----------|----------------------------------|---|------------------------------------|--|------------------|
| | | | s. d. | | | |
| 1868. | 26½ | 41½ | 6 8½ | 245 | 73·4 | £12 12 6½ |
| 1869. | 44¼ | 24¾ | 6 10¾ | 222¼ | 47·8 | 3 14 11¼ |
| 1870. | 42¾ | 23½ | 7 6¼ | 277 | 39·6 | 3 4 9½ |
| Avg. | ... | 30 | 7 0½ | 248 | 53·6 | 6 10 9 |

Each year thus shows worse than its predecessor. Whether 1871 would have followed the same course it is difficult to say; the stacks of that year having been sold by auction for

Thin Sowing of Wheat a Failure.

£247, and a little wheat that had been previously thrashed having been sold for £16. The $25\frac{3}{4}$ acres thus realised £263, or rather more than £10 per acre; but as this was before thrashing, we must, in deducting the average outlay per acre, exclude such charges. This would show a profit per acre of about £3 10s; so that in all probability, had it been sold in the regular way, it would have proved superior to either 1869 or 1870; though very much inferior to 1868, which must be looked upon as quite an exceptional season.

Thin sowing of wheat has been much advocated, and was twice made the subject of experiment at Blennerhasset. The first trial was made in 1869 on the Gillgooden field. One and two imperial bushels per acre respectively were drilled in by the machine, each plot measuring about three-fourths of an acre. The produce was speedily thrashed (Sept. 8th), and gave the following results:—

TABLE VIII.—EXPERIMENTS ON WHEAT SOWN BY THE DRILL AT THE RATE OF ONE AND TWO IMPERIAL BUSHELS, 1868-9.

| Seed per acre. | Yield per acre of Wheat. | Weight per Bushel. | Yield per acre of Straw. | Corn to 100 of Straw. |
|----------------|--------------------------|--------------------|--------------------------|-----------------------|
| | Bshls. Pecks. | | | |
| 1 bush. | 27 2 $\frac{1}{2}$ | 64 lbs. | 36 $\frac{3}{4}$ cwts. | 42·9 |
| 2 „ | 29 0 $\frac{3}{4}$ | 64 $\frac{1}{4}$ „ | 34 $\frac{1}{2}$ „ | 48·6 |

In the above experiments, the thin seeding is in every way, except the weight of straw, behind the 2 bushels seeding. The differences were, however, slight: and as we had a leaning towards thin seeding, another and more complete trial was resolved upon. And, as the farm bailiff believed in “the drill for oats, but the *hand* for wheat,” one plot sown broadcast by himself was included.

This second trial was made in 1869-70, in West Wet-flat field; and the results were published at the time in several of the agricultural journals. The report stated that “thin sowing is so strongly advocated by some who are favoured with a milder climate than ours, that the following results of a trial

Drill-sown Wheat—Two to Fourteen Pecks per Acre.

of it, as against medium and thick sowing, will prove useful. The winter was a severe one, and well calculated to test the matter thoroughly; its severity is well shown by the comparative smallness of the yield, the best not giving eight Carlisle bushels per acre. The field sloped gently to the north; and the soil, though too light to be a good wheat soil, was otherwise in fair condition. The previous crop had been first year's hay. The land was well grubbed and ploughed in September, and the wheat sown Oct. 22, in favourable weather. The seed—Hallet's White Pedigree, of two years' previous home growth—was well brined before sowing. Each plot was two drill widths, and measured over a quarter of an acre; except the hand-sown plot (broadcast), which was one measured acre."

TABLE IX.—THICK *versus* THIN SOWING OF WHEAT,
1869-70—SECOND EXPERIMENT.

| No | | Seed per Acre. | | Total Corn per acre in Lbs. | Dressed Corn less the Amount of Seed. | | Wght. per Bushel | Straw per acre. | Corn to 100 of straw |
|----|--------------------|----------------|------|-----------------------------|---------------------------------------|------|------------------|-----------------|----------------------|
| | | Bshls. | Pks. | | Bshls. | Pks. | | | |
| 1 | Broadcast by hand | 2 | 1 | 842 | 12 | 2½ | 56¾ | 40 0 | 17.1 |
| 2 | Drill 6 inch rows. | 2 | 0¾ | 905 | 13 | 1½ | 58¼ | 46 1 | 17.6 |
| 3 | " 12 " | 1 | 0¼ | 711 | 11 | 0¾ | 58 | 31 2 | 20.2 |
| 4 | " 12 " | 0 | 2¾ | 857 | 14 | 0¼ | 58¼ | 31 2 | 24.2 |
| 5 | " 6 " | 3 | 2¾ | 993 | 13 | 1¼ | 58½ | 49 3 | 17.9 |
| 6 | " 12 " | 1 | 2¾ | 836 | 12 | 2¼ | 58½ | 36 3 | 20.3 |
| 7 | " 6 " | 1 | 2½ | 1308 | 20 | 1 | 59¾ | 43 2 | 26.9 |
| 8 | " 8 " | 1 | 2½ | 1007 | 15 | 1¼ | 59½ | 40 0 | 22.5 |
| 9 | " 8 " | 2 | 0 | 1146 | 17 | 1 | 59½ | 40 2 | 25.3 |
| 10 | " 8 " | 2 | 3 | 1117 | 16 | 1 | 58¾ | 33 2 | 27.0 |
| 11 | " 8 " | 1 | 0¼ | 955 | 15 | 0¾ | 59 | 34 0 | 25.0 |

"The results show hand-sowing inferior to the drill. Of the drill-sown plots, 1½ bushels in six-inch rows gave the best return. But, taking the experiments as a whole, the eight-inch rows prove superior; and at eight inches, two imperial bushels of seed per acre gave the best return: and a close analysis of the results shows that any seed over that quantity *lessens* the crops. Plots 6, 7, and 8 were sown at as nearly the same rate per acre as the drill would permit. Plots 2,

Wheat drilled in Eight-inch Rows does best.

3, and 8, had the same quantity of seed per row, though, of course, different quantities per acre. Plots 4 and 11, and 5 and 10, had also the same seeding per row."

The report took up merely the main practical conclusions, as, at the time, further experiments were contemplated. But, now that these are impossible, it will be well to see what other lessons are taught by these experiments.

First, as regards the space between the rows of drill-sown wheat, let us compare the results from the three different intervals experimented upon.

| | At 6-inch intervals. | | At 8-inch intervals. | |
|--|----------------------|----------------|----------------------|----------------|
| | Bush. | Pecks. | Bush. | Pecks. |
| A seeding of more than $2\frac{1}{2}$ bushels gave | 13 | $1\frac{1}{4}$ | 16 | 1 |
| „ about 2 „ „ | 13 | $1\frac{1}{2}$ | 17 | 1 |
| „ less than 2 „ „ | 20 | 1 | 15 | $1\frac{1}{4}$ |
| Average of the three, | 15 | $2\frac{1}{2}$ | 16 | 1 |

This shows the eight-inch intervals superior to the six-inch. The twelve-inch intervals could not be compared in the above, the quantities of seed being too small; but with two of the eight-inch intervals they may be compared.

| | 8-inch intervals. | | 12-inch intervals. | |
|--|-------------------|----------------|--------------------|----------------|
| | Bush. | Pecks. | Bush. | Pecks. |
| A seeding of about $1\frac{1}{2}$ bushels, | 15 | $1\frac{1}{4}$ | 12 | $2\frac{1}{4}$ |
| „ „ 1 „ „ | 15 | $0\frac{3}{4}$ | 11 | $0\frac{3}{4}$ |
| „ less than 1 „ „ | — | — | 14 | $0\frac{1}{4}$ |
| Averages, | 15 | 1 | 12 | $2\frac{1}{2}$ |

This shows the eight-inch intervals superior to the twelve-inch, the difference being considerable.

Looking now at the quantities of seed per acre, let us divide these into classes, and compare their averages.

| Intervals. | Over 3 Bshls. | Between 2 & 3. | About $1\frac{1}{2}$ bshls. | Under $1\frac{1}{2}$ bshls. |
|------------|-------------------|-------------------|-----------------------------|-----------------------------|
| Inches. | Bshls. Pecks. | Bshls. Pecks. | Bshls. Pecks. | Bshls. Pecks. |
| 6 | 13 $1\frac{1}{4}$ | 13 $1\frac{1}{2}$ | 20 1 | — — |
| 8 | — — | 16 1 | 15 $1\frac{1}{4}$ | 15 $0\frac{3}{4}$ |
| 8 | — — | 17 1 | — — | — — |
| 12 | — — | — — | 12 $2\frac{1}{4}$ | 11 $0\frac{3}{4}$ |
| 12 | — — | — — | — — | 14 $0\frac{1}{4}$ |
| Avrgs, | 13 $1\frac{1}{4}$ | 15 $2\frac{1}{2}$ | 16 0 | 13 $1\frac{3}{4}$ |

One and a Half Bushels of Seed per Acre gives the best Crop.

This shows that about $1\frac{1}{2}$ imperial bushels was the best quantity of seed for drill-sowing. The 2 bushels per acre is not far behind it; and if we discount the exceptional yield of Plot 7, the 2 bushels shows decidedly the better; and as such I should be inclined to regard it. But, as noted before, every increase of seed beyond 2 bushels per acre reduced the yield of grain.

Testing, now, the quality in the same manner, as it is shown by the weight of the wheat per bushel, and by the proportion of corn to straw, we get the following averages:—

| | | Weight per Bushel. | | Corn to 100 of Straw. |
|-------------------|-----|-----------------------|-----|--------------------------|
| 6-inch intervals, | ... | 58·8 lbs. | ... | 20·8 |
| 8 ,, | ... | 59·2 ,, | ... | 24·9 |
| 12 ,, | ... | 58·2 ,, | ... | 21·6 |

Again the 8-inch intervals stand in every respect superior, the wheat being the heaviest, and the proportion of corn to straw the largest. But between the six and twelve-inch intervals there is less to choose, the six-inch being superior in weight per bushel, but inferior in the proportion of corn to straw. Comparing now the quality from the different quantities of seed, we get the following averages:—

| Quantity of Seed. | | Weight per Bushel. | | Corn to 100 of Straw. |
|-----------------------------------|-----|--------------------|-----|--------------------------|
| 2 bushels and over, | ... | 58·75 lbs. | ... | 21·95 |
| About $1\frac{1}{2}$ bushels, | ... | 59·25 ,, | ... | 23·23 |
| Less than $1\frac{1}{2}$ bushels, | ... | 58·41 ,, | ... | 23·13 |

This again shows the $1\frac{1}{2}$ bushels superior. And as the solitary plot seeded with 2 bushels (No. 9) is still better, showing a weight of 59·5 lbs. per bushel, and a proportion of 25·3 of corn to every 100 of straw, the former conclusion—that any increase of seed over 2 bushels deteriorates the crop—is again ratified.

The weight of straw per acre might be also analysed, but perhaps we have already dwelt too long on the results of only two years' experiments. Our chief reason for this is that we were prejudiced in favour of thin seeding; but from the above, and from some informal experiments, we have

Average Crop Profits and Losses at Blennerhasset.

been convinced that in the North of England "one imperial bushel of seed" is much too little; and that the best quantity is from $1\frac{1}{2}$ to 2 bushels, sown by the drill, and at 8-inch intervals.

After wheat we always valued the land as £1 per acre worse, even when much manure had been applied. This valuation was an arbitrary one; but, even with this disadvantage, the wheat crop proves about the best in our experience: for, taking the average profit, as shown in the cropping sheets (most of which are the average of three and some of four years), and deducting from this the rough estimated improvement or deterioration of the land, the average results are as below.

TABLE X.—AVERAGE PROFITS OBTAINED PER ACRE, FROM THIRTEEN DIFFERENT CROPS, IN 1868, 1869, AND 1870. AND THESE ALSO AS AFFECTED BY THE AFTER-CONDITION OF THE SOIL.

| Kind of Crop. | Average Profit or Loss * per Acre. | Soil Improved or Impoverished. * | Nett Profit or Loss * per Acre. |
|----------------|------------------------------------|----------------------------------|---------------------------------|
| Barley..... | £4 19 6 $\frac{1}{4}$ | *£1 0 0 | £3 19 6 $\frac{1}{4}$ |
| Cabbages..... | 0 17 8 | 2 0 0 | 2 17 8 |
| Carrots..... | 4 2 10 $\frac{1}{4}$ | 4 0 0 | 8 2 10 $\frac{1}{4}$ |
| Flax..... | 5 10 10 | *1 0 0 | 4 10 10 |
| Lea Hay..... | 4 13 4 $\frac{1}{4}$ | 0 10 0 | 5 3 4 $\frac{1}{4}$ |
| Meadow Hay | 2 17 1 $\frac{1}{2}$ | 0 10 0 | 3 7 1 $\frac{1}{2}$ |
| Mangolds..... | 0 3 1 $\frac{1}{4}$ | 3 0 0 | 3 3 1 $\frac{1}{4}$ |
| Oats, Common | 5 7 11 $\frac{1}{2}$ | *1 0 0 | 4 7 11 $\frac{1}{2}$ |
| Oats, Canadian | 3 13 5 | *1 0 0 | 2 13 5 |
| Pasture Grass | 1 2 10 | 1 0 0 | 2 2 10 |
| Potatoes..... | *2 3 7 $\frac{1}{4}$ | 3 0 0 | 0 16 4 $\frac{3}{4}$ |
| Swede Turnips | *5 6 3 $\frac{1}{4}$ | 3 0 0 | *2 6 3 $\frac{1}{4}$ |
| Wheat..... | 6 10 9 | *1 0 0 | 5 10 9 |

* An asterisk prefixed to a sum signifies a loss.

Carrots is the only crop in the above that exceeds wheat, but as it is not a general farm crop, and can be grown to pay as above only on special soils, wheat stands highest in our experience. Second to wheat comes lea hay, then flax

Brief Summary of the Chapter.

(a very doubtful case), then oats, barley, meadow hay, mangolds, cabbages, &c., &c.; swede turnips alone showing a positive loss. It must, however, be borne in mind that the above estimates of the improvement or the impoverishment of the soil are not *general*, but particular, the quantity of manure and the cost of tillage having been considered in each case. But this question is a large one, and as we had to value the after-condition of the land for the balance sheets of 1869 and 1870; the figures we adopted, and our reasons for adopting them, are the subject of fuller consideration in the next chapter.

Exclusive of the Field Balance-sheet facts, which could not be epitomised here, the main points of this chapter may be briefly summarised as follows:—

1. That the best time for planting potatoes was in February or early in March.
2. That neither frost nor snow, at planting time, seemed to affect the crop.
3. That potato drills, twice split, grew a heavier crop than those once split.
4. That the fields heaviest seeded with potatoes paid worst.
5. That by re-splitting our potato drills, the crop was increased $7\frac{1}{2}$ cwt. per acre.
6. That about 12 tons of potatoes stored in pit for 170 days, lost nearly $2\frac{1}{2}$ cwt. in each ton.
7. That 419 tons of potatoes lost, between storing in pits and sorting for sale, 1 cwt. 47 lbs. in each ton.
8. That potatoes grown after grass were of better quality, though less in weight, than those grown after oats.
9. That 36-inch potato drills grew a better quality, though less weight, than narrower drills.
10. That in 1871 our Regent potatoes were diseased more than two-thirds, the Rocks less than one-third, and the Skerries hardly at all.
11. That in the four years 1868-1871 our loss by potato disease averaged 11.7 per cent.
12. That our best wheat crops were grown after potatoes, poor ones after hay, and still poorer ones after wheat.

Brief Summary of Chapter xvi.

13. That in sowing wheat by the drill, about $1\frac{1}{2}$ bushels, and certainly not more than 2 bushels, per acre, proved the best seeding.
14. That 8-inch intervals proved the best for drill-sown wheat.
15. That in point of profit, our crops stood thus:—Carrots, wheat, lea hay, oats, barley, meadow hay, &c.; potatoes standing last in point of profit; and swedes alone proving a loss.

CHAPTER XVII.

MANURES AND THEIR VALUE.

MR. LAWSON'S first intention was to have a great stock farm, after the plan of Mr. Mechi's at Tiptree Hall; and hence the name "Mechi Farm" at first given to the estate.

Farming was commenced in February, 1862, but it was 1865 before the farm buildings were all completed and attention turned to farming alone: 1866 is, accordingly, the year of greatest activity. Stall-feeding of sheep was tried then, and large sums were expended on cattle, sheep, and feeding stuffs. The Newcastle and Carlisle shops were also then opened, as outlets for the milk, beef, mutton, and vegetables. But, as has been seen, the profits bore an inverse ratio to the activity; and, as 1867 proved no better, it was evident that change of some kind was necessary. It was then that Mr. Lawson decided to try farming without cattle; and hence, after 1867, only a very trifling head of stock was kept, the numbers being gradually reduced, till, in 1870, only two cows remained. This gives six years' farming with cattle, and four without them. The latter mode of farming, though too brief for any decisive results as an experiment, is not without interest.

Throughout this chapter, facts from various sources, which were found of value to ourselves, are given; both as explaining the ground of the experiment, and also in the belief that agricultural readers will find them useful. The question of unexhausted manures is noticed, and our attempts to estimate their value described. The composition of the special manures used on the farm is explained, and their advantages and disadvantages are compared with those of farmyard manure. Some recent analyses of farmyard manure are also given, and their values estimated. Soil exhaustion, too, is touched upon; and the severity of the different crops in this respect compared and roughly estimated.

The first point to be taken up is the value of manure

Annual Values of Manure Applied at Blennerhasset.

applied each year—an amount which varied from less than £2 up to nearly £6 per acre. To include in those amounts the cattle manure is a little difficult, but it may be approximately estimated. Up till 1867 the cattle made into meat, milk, and manure,—unfortunately chiefly manure,—the produce of nearly 300 acres: as only £1,376 worth, or just £1 per acre of farm produce was sold during that period. In addition, the cattle and horses consumed £5,252 worth of purchased foods, chiefly oats. To estimate the farm produce and the resulting manure, the annual produce may be safely estimated at £6 per acre—a sum 25 per cent. lower than our average annual sales. On this basis 1862-4 would supply per annum £1,560 of farm produce, and 1865-6, £1,800. Deducting now the trifling sales of farm produce, and dividing by five, we should come nearly about the value of the cattle manure. One-fourth the value of the food might perhaps be nearer Messrs. Lawes and Gilberts' estimates; but, considering the kind of food, it is well to keep on the safe side, and to estimate the manure at only one-fifth. Dividing also the purchased foods by five, and adding both sums together, we get the figures given below for cattle manure, for 1862 to 1866 inclusive. After that period, the expenditure on cattle being separated from that of the farm, the manure used by the farm was credited to the cattle at the rate of 7s. 6d. per ton.

TABLE I.—MANURE APPLIED TO THE BLENNERHASSET FARM, PER ANNUM AND PER ACRE, 1862 TO 1872.

| Year. | Cattle Manure. | Purchased Manures. | Total Manure. | Acreage each Year. | Manure per Acre. |
|------------|----------------|--------------------|---------------|--------------------|------------------|
| *1862-4 | £1198 | £1386 | £2584 | 260 | £3 6 3 |
| 1865 | 490 | 425 | 915 | 300 | 3 1 0 |
| 1866 | 742 | 1013 | 1755 | 300 | 5 17 0 |
| 1867 | 148 | 372 | 520 | 296 | 1 15 1 |
| 1868 | 105 | 531 | 636 | 296 | 2 2 11 |
| 1869 | 12 | 638 | 650 | 296 | 2 3 10 |
| 1870 | 37 | 1374 | 1411 | 382 | 3 13 10 |
| 1871 | 33 | 1448 | 1481 | 380 | 3 17 11 |
| Avrgs. . . | 276½ | 718¾ | 995¼ | 303 | 3 5 8 |

*The figures of the first line are those of three years.

Heavy Manuring in 1866.

The purchased-manure column includes lime and also farm-made compost.

For 1866 the figures are alarming; but of the £5 17s. worth of manure per acre, probably nearly £1 worth should go to 1867, bringing it up to £2 15s. per acre. But even deducting £1 from 1866, the manuring of that year must have been enormous. Cattle food, chiefly oats, were purchased, costing £2466, and must have been nearly all consumed during the year, as the greater number of the cattle and sheep were sold by auction early in 1867. The manure accounts show 108 tons of purchased manure applied in 1866; and of this at least 60 tons were bones, in one form or another. The cattle manure, too, so abounded, that much had to be stored in great heaps; four or five of which were to be seen in the spring of 1867, placed in the corners of the larger fields. Most of them were covered over with soil, which was a partial protection; but much must have been wasted. In 1868 the £105 worth of cattle manure was applied chiefly to the 16½ acres of potatoes; which received besides about 4 cwts. per acre of potato manure.

In some of the experiments it was necessary to assume a certain composition for the cattle manure; a difficult matter, depending, as it does, chiefly on the contained nitrogen, phosphoric acid, and potash: the following analyses may, however, be taken as samples. The prices used in the valuations are as follows:—

Nitrogen, 10d. per lb.; from Nitrate of Soda at 15s. per cwt.

Phosphoric Acid, 3¾d. per lb.; from Superphosphate (28) at 4s. 6d. per cwt.

Potash, 2d. per lb.; from Muriate of Potash at 9s. 6d. per cwt.

These are pretty nearly the present market values; but the tendency is even yet upwards. To value manures from an analysis, at the above rates, the multiplier for nitrogen would be 18s. 8d. per unit; for phosphoric acid, 7s. (equal to 5s. 0½d. for bi-phosphate, or 3s. 2¾d. for bone earth made soluble); and for potash, 3s. 8¾d. per unit.

The first is the average of eight, by Dr. Anderson (published in the Transactions of the Highland and Agricultural Society for 1871); the second is the lowest of these eight;

Farmyard Manure—Analyses and Values of Six Samples.

and the third is the highest. No. 4 is an analysis by Dr. Voelcker of good manure when fresh; and No. 5 the same when rotten after standing a year, with the loss of about half of its original weight; No. 6, by Mr. W. C. Spooner, is taken from page 103 of "Hints to Farmers," a useful book, published by George Routledge; and No. 7 is the average of all, except the highest, which was thought too uncommon, and therefore likely to spoil the average.

TABLE II.—QUANTITIES AND VALUES OF NITROGEN, PHOSPHORIC ACID, AND POTASH IN ONE TON OF FARMYARD MANURE.

| No. | Authority. | Nitrogen. | Potash. | Phos. Acid. | Value per ton. |
|-----|--------------------|----------------------|--------------------|--------------------|-----------------------|
| 1 | Anderson, . . | 9 $\frac{1}{4}$ lbs. | 9 lbs. | 5 lbs. | £0 10 8 $\frac{1}{2}$ |
| 2 | Do. | 4 $\frac{1}{4}$ " | 2 $\frac{1}{4}$ " | 3 $\frac{3}{4}$ " | 0 5 1 $\frac{1}{4}$ |
| 3 | Do. | 62 $\frac{1}{2}$ " | 42 " | 46 " | 3 13 5 $\frac{1}{2}$ |
| 4 | Voelcker (fresh) . | 14 $\frac{1}{2}$ " | 15 " | 8 $\frac{3}{4}$ " | 0 17 4 |
| 5 | Do. (rotten) . . | 13 $\frac{1}{4}$ " | 11 $\frac{1}{4}$ " | 12 $\frac{1}{2}$ " | 0 17 1 $\frac{1}{4}$ |
| 6 | Spooner | 9 " | 7 " | 7 " | 0 10 10 $\frac{1}{4}$ |
| 7 | Average of five . | 10 " | 8 $\frac{3}{4}$ " | 7 $\frac{1}{2}$ " | 0 12 2 $\frac{1}{2}$ |

The average thus shows a value of 12s. 2 $\frac{1}{2}$ d. per ton; but as these analyses must be chiefly of manure made by cake-fed stock, Nos. 1 and 6, value about 11s. per ton, are perhaps nearer the common average; and it is only through mismanagement that cattle manure can ever analyse like No. 2, value 5s. 1 $\frac{1}{4}$ d. Professor Voelcker found that in fermentation, a manure heap, when freely exposed to the weather, lost nearly half its weight in twelve months; and this not so much by evaporation as by drainage—an evil quite preventible by keeping the manure under cover, or spreading it when fresh on the land. At the time that Professor Voelcker analysed Nos. 4 and 5, nitrogen was very much cheaper and the other two substances dearer; and 13s. 6d., instead of 17s. 3 $\frac{1}{4}$ d. per ton, was the estimated value of No. 4.

I now pass to the consideration of the chemical or artificial manures; of which £7187 worth was used on the farm during ten years, being at the average rate of £2 1s. 4d. per

Composition of the Special Manures Mixed at Blennerhasset.

acre per annum. Bones were largely used at first; but, for reasons before stated, none were purchased after 1866. In 1867, special manures were mixed for the various crops; but their composition was altered yearly, as the field experiments of the previous year suggested improvements. Below is a statement of their general composition per cent., for 1869 and 1871; and the manures are mentioned in the order in which they are afterwards considered separately:—

TABLE III.—COMPOSITION PER CENT. OF THE SPECIAL MANURES MADE IN 1869 AND 1871.

| No. | Manures. | Wheat. | | Grass. | | Potato. | | Turnip. | |
|-----|---|--------|------|--------|------|---------|------|---------|------|
| | | 1869 | 1871 | 1869 | 1871 | 1869 | 1871 | 1869 | 1871 |
| 1 | Sulphate of Ammonia . | 13 | 27 | 13 | 21 | 13 | 22 | 3 | 14 |
| 2 | Nitrate of Soda . | 5 | .. | 5 | .. | .. | .. | .. | .. |
| 3 | Peruvian Guano . | 6 | .. | 6 | .. | 4 | .. | 4 | .. |
| 4 | Muriate of Potash . | 4 | .. | 4 | 10 | 19 | 20 | 5 | 9 |
| 5 | Dissolved Bones . | 9 | .. | 9 | .. | 15 | .. | 22 | .. |
| 6 | Superphosphate . | 44 | 62 | 44 | 60 | 36 | 50 | 48 | 70 |
| 7 | Salt . | 7 | 6 | 7 | 5 | 5 | 5 | 8 | 7 |
| 8 | Bone Dust and Sulph- ate of Magnesia . } | 5 | .. | 5 | .. | 4 | .. | 4 | .. |
| 9 | Manure Drier . | 7 | 5 | 7 | 4 | 4 | 3 | 6 | .. |
| | Price per cwt. . | 8/3 | 8/9 | 8/3 | 8/9 | 9/ | 9/9 | 7/3 | 7/9 |

Looking now at these special manures from the standpoint of six years' experience on our light land, we would be inclined to alter some of them still further. The potato and turnip manures of 1871 are, as far as our land was concerned, nearly the best we could make with the raw materials offered in the market. But, for wheat, a better mixture would be about half sulphate of ammonia and half superphosphate; four cwts. to be applied in autumn, and, if necessary, to be aided in April by 1 or 1½ cwts. of nitrate of soda, per acre. For oats, the wheat manure may be used, if sown early, say in March; but, after this month nitrate of soda is preferable. For barley, on our light soil, nitrate of soda used alone proved superior; but, generally, we would

Sulphate of Ammonia and Nitrate of Soda.

prefer, say $1\frac{1}{2}$ cwts. of nitrate with $2\frac{1}{2}$ cwts. of superphosphate; decreasing the latter in proportion to the lateness of application. For grass, the kind of manure depends more upon the nature of the soil; and our experiments on this are given in a special chapter. For cabbages, the potato manure did well; but for carrots, the turnip manure is better. For mangolds, when cattle manure cannot be had, the potato manure is the next best.

The raw materials going to make up these manures require some short notice: each is taken in the order mentioned in the preceding Composition table.

Sulphate of Ammonia, No. 1 in the above table, was a manure very largely used by us; and tried frequently on grass, oats, potatoes, &c., against nitrate of soda. The parcels bought were always subjected to some general tests; and two purchases were analysed, one of which showed the high strength of 25.47 per cent. of ammonia. In the experiments it was generally valued at 23.85, equal to 19.64 per cent of nitrogen; or 22 lbs. in each cwt. of the manure.

Nitrate of Soda, No. 2 in the table, was estimated to contain 18 lbs. of nitrogen per cwt. of manure. This equals 16.07 per cent., and allows some margin for the trifling impurities generally met with in commercial samples. Not much was used; chiefly because of its damp nature, which spoiled several of our first attempts at making a wheat-manure. One lot, weighing some four or five tons, grew heavier and pastier every day; and finally we had to re-mix it in small quantities with other manures.

Peruvian Guano, No. 3, was estimated to supply, per cwt., 14 lbs. of nitrogen, or 12.5 per cent.; equal to 15.18 per cent. of ammonia. This was about the average of good guano up to 1870, when we made our last purchase; but the general published analyses of the dealers were always higher; they, of course, showing their best to intending purchasers.

Muriate of Potash, No. 4, ranged in strength from 80 to 83 per cent., containing about 58 or 60 lbs. of potash per cwt. Sulphate of potash was purchased only for the experiments, and analysed 83.4 per cent.

Dissolved Bones, No. 5, were our own make, and the

Dissolved Bones—Method and Cost of Making.

bones used were chiefly shanks, the hardest and most phosphatic kind. For dissolving, we used white vitriol of full strength; thinking it cheaper to purchase this because of the very heavy railway carriage. Brown vitriol of 1·40 specific gravity, being about half water, its purchase doubles the already almost prohibitive cost of railway carriage. To our strong vitriol much water had, of course, to be added: and in the following details of a two months' making, the quantities are well proportioned:—

| | | | | | |
|----------------|----------|---------|---------|----------|----------------|
| Ground Bones, | 28 tons, | 4 cwts, | 0 lbs.; | equal to | 59·8 per cent. |
| White Vitriol, | 9 „ | 19 „ | 47 „ | „ | 21·1 „ |
| Water, | 9 „ | 0 „ | 0 „ | „ | 19·1 „ |
| Totals, | | | | | 100·0 |

The labour of dissolving this cost £12 10s. 6d., or 5s. 0½d. per ton. It employed two men, at 17s. each per week, for about seven weeks. Two fire-clay troughs were used, both much too small for the purpose. Into these the bones, chiefly about quarter-inch, were first placed; water was then poured over them, and afterwards the acid; the mass was then well stirred for a few minutes, and allowed to stand while the other trough was being emptied and refilled. The contents, when lifted out, were hot and steaming; and in this state were placed on the top of the heap, which at one time reached a height of nine feet. The dissolving was always done in the autumn, so that several months elapsed before use. In spring the mass turned out comparatively dry, but could never be compared with the purchased superphosphate. Before the chemist came, salt was largely used in the process of dissolving; with the result of a wet compound, difficult to dry; and then hot lime had to be employed to make it usable. No exact analysis of these dissolved bones was made; but 10·3 of bi-phosphate, equal to 16·0 of soluble phosphate, 17·8 of insoluble phosphate, and 2·0 of ammonia, would be about the per centage composition.

The superphosphate, No. 6, was Packard's make, and purely mineral. It analysed 18·23 of bi-phosphate, equal to 28·55 of soluble phosphate; but was guaranteed only 25, and is taken generally as 27. It was always dry and mealy.

A want of Method in the Earlier Cropping and Manuring.

The salt, No. 7, was principally bacon sweepings, containing a trace of saltpetre.

The manure-drier, No. 9, was partly bone-ash pulverised to a meal; which, being sharp, kept the manures free for sowing. Latterly the manure-drier used was a desiccated gypsum—a very good substance for the purpose, but liable to cake the manure if added in too great quantity.

The sulphate of magnesia, except that used in the hay experiments, was the calcined variety; but, as is shown in the experiments on hay, this salt was not of much use. Only about 8 tons of it were purchased, in the earlier part of the business.

These different manures, alone, and in mixture, were largely used on the farm, as has been seen; and at first but little method was shown in their application, many fields being overdosed and others neglected. This may be gathered from the fact, that though no rotation was followed, no reliable record was kept of the cropping of the different fields. Latterly some attention was paid to previous cropping and manuring, but the early neglect led to some confusion, and hence such a course of cropping as that on East Longlands, which was not once in hay for ten years. These shortcomings, however, would all have been rectified through time; for hay and rotation were growing in favour; a favour which would have been greatly increased by the study of our cropping sheets. For it should be borne in mind that the cropping sheets for each year were never made out until nearly every scrap of that year's produce had been sold and paid for. This generally delayed their appearance till about eighteen months after the end of the calendar year. As a consequence, the cropping details of 1870 were not ready till some time after the estate was sold; and the useful lessons on rotation which they teach came much too late to be of any practical use to us.

Unexhausted manures and tillage have been referred to, as affecting the profits and losses shown by the different crops. This difficult question we tried to solve by experiment; but found that a three years' trial only seemed to increase the difficulties; and that many and long-continued

Rotation Experiments with various Weights of Manure.

TABLE IV.—ROTATION MANURE EXPERIMENTS.—CROP RETURNS, 1870, 1871, AND 1872.

| No. | MANURE PER ACRE IN 1870. | 1870. | | Wheat, 1871. | | 1872. | | Value per Acre over the 3 Years. | No. |
|-----|------------------------------|-----------|---------------|-----------------|--------|------------|---------|-------------------------------------|-----|
| | | Potatoes. | T. cwts. lbs. | Bush. | Pecks. | Cwts. lbs. | Hay. | | |
| | | | | | | | | | |
| 1 | No Manure | 7 16 8 | 12 | 3 $\frac{3}{4}$ | 46 14 | 2 3 107 | £ s. d. | 35 11 3 | 1 |
| 2 | Potato Manure, 18 cwts. . . | 11 8 104 | 15 | 2 $\frac{3}{4}$ | 50 28 | 2 7 19 | | 47 16 4 | 2 |
| 3 | Farmyard Manure, 15 tons . . | 9 12 96 | 14 | 1 $\frac{1}{4}$ | 53 28 | 2 11 12 | | 41 19 7 $\frac{1}{2}$ | 3 |
| 4 | Potato Manure, 9 cwts. . . . | 10 11 8 | 12 | 1 $\frac{1}{2}$ | 46 35 | 2 11 93 | | 45 5 7 $\frac{1}{2}$ | 4 |
| 5 | Farmyard Manure, 10 tons . . | 7 19 32 | 12 | 2 | 42 21 | 2 10 61 | | 37 8 3 | 5 |
| 6 | No Manure | 6 19 72 | 14 | 0 $\frac{1}{2}$ | 40 56 | 2 11 30 | | 36 3 5 | 6 |
| 7 | Potato Manure, 15 cwts. . . | 10 6 48 | 13 | 1 | 44 49 | 2 16 28 | | 46 11 3 $\frac{1}{2}$ | 7 |
| 8 | Farmyard Manure, 20 tons . . | 9 2 96 | 14 | 1 $\frac{3}{4}$ | 48 10 | 2 10 106 | | 41 11 8 | 8 |
| 9 | Potato Manure, 21 cwts. . . | 11 14 72 | 13 | 1 $\frac{1}{4}$ | 39 42 | 2 14 63 | | 49 18 11 $\frac{1}{2}$ | 9 |
| 10 | Potato Manure, 6 cwts. . . . | 9 13 24 | 11 | 2 $\frac{1}{2}$ | 32 28 | 2 12 80 | | 41 15 8 $\frac{1}{2}$ | 10 |
| 11 | No Manure | 7 8 24 | 13 | 0 $\frac{1}{2}$ | 31 56 | 2 12 35 | | 35 14 4 | 11 |

Necessity for Long-continued and Numerous Field Experiments.

experiments would be necessary, to lessen the amount of error from differences of season, soil, &c. To this end more than one series of experiments were in progress when we gave up farming in 1871. In the absence of anything better, the results of this three years' trial may be given. First among its drawbacks stands a piece of land too high in condition; this the unmanured plots show. Secondly, the occurrence of a very bad season, when the plots were under wheat; and thirdly, the occurrence, conversely, of a very good season, when they were under grass for hay—a season so good for this crop, that the want of manure told but little against a heavy yield.

A glance at the results of the third season, suffices to show that the above experiments are quite insufficient, for anything like a satisfactory solution of the question of the after value of the manures. These experiments are therefore offered only as a contribution to this subject. Other facts bearing also on the same question, are furnished by the series B, C, and D of the three years' continuous experiments on potatoes in Chapter XX. But all these, and many others of a similar nature on oats, barley, &c., were found quite inadequate to form a satisfactory basis, for a valuation of the unexhausted manures.

But it became imperative, in the end of 1870, that some attempt should be made to estimate the after-value of the £1500 worth of manure applied that year, and with the responsibility of this attempt the chemist was saddled.

On looking into the literature of the subject he found many diverse opinions. Messrs. Lawes and Gilberts' suggestions could not apply, being based on the amount of the produce, and with reference to the cattle feeding and manure. One estimate that bore the stamp of authority, occurred in a paper on Tenant Right, read by Professor Wrightson before the Hexham Farmers' Club in January, 1872. The Professor, in this paper, quoted a Mr. Piper, who had reproduced from the scheme of an eminent land agent in Devonshire, as follows: The tenant to receive compensation for unexhausted improvements according to the following rules—I. Bone manure with turnips over

Our Attempts to Value the Unexhausted Manures of 1870.

five years, 1st year, 20s. in £; 2nd year, 10s.; 3rd, 5s.; 4th, 3s.; 5th, 2s. Rule II.—Guano over four years, 1st, 20s.; 2nd, 8s.; 3rd, 4s.; 4th, 2s. Rule III.—Superphosphate of lime and turnip manure, same as Rule II. Rule IV.—Corn, linseed, or oilcake, used in last year of tenancy by fattening cattle or sheep, to be repaid one-fifth. Rule V.—Purchased yard, pig, or any decomposed manure, 1st year, 8s. in the £; 2nd year, 4s. But these rules, though they might be applicable where a regular rotation was pursued, and much of the crop consumed by cattle, were much too favourable for us; giving, as they would have done, a valuation of £600 for unexhausted chemical manures alone.

Puzzled here, the next attempt was a more scientific one; and consisted in valuing the amounts of nitrogen, phosphoric acid, and potash, removed by the crops from the soil. But here one great difficulty, only to be appreciated by those who have tried it, was to know the normal composition of the ash of the various crops—the various authorities differing so much in their results. However, averages were taken of published analyses by Professor Voelcker and A. J. Sibson, his late assistant; and generally too, of those by Messrs. Lawes and Gilberts. Table V., page 301, shows the averages so obtained, and gives also an approximate valuation of each. The nitrogen is calculated at 10d. per lb., the phosphoric acid at 3¾d., and the potash at 2d. per lb.

Perhaps the most notable point in this table is the comparative severity of the Lea hay crop, which much exceeds that of any of the commoner green crops. The difference lies chiefly in the amount of nitrogen it removes; and, as nature supplies much of this, all of the above valuations must be looked upon as merely comparative.

This scientific basis will doubtless be recognised by many readers, as an attempt to construct for our farm, that “chemical balance-sheet” of the incomings and outgoings of a farm; which an eminent chemist, many years ago, had recommended to be done by every farmer. As the seeming simplicity of the scheme may have charmed others, as it did ourselves, it may be well to give the total additions of the two sides of the account, as it stood for about 360 acres of

Weight and Value of Manurial Matters Removed by Various Crops.

TABLE V.—WEIGHT AND VALUE OF NITROGEN, PHOSPHORIC ACID AND POTASH, REMOVED FROM THE SOIL BY VARIOUS CROPS.

| No. | KIND OF CROP. | Weight of Crop taken. | Nitrogen. | Phosphoric Acid. | Potash. | Value of the three. | Probable Amount of Crop per Acre. | Probable Value Removed Per Acre. | No. |
|-----|---------------|----------------------------------|--------------------|-------------------|-------------------|---------------------|-----------------------------------|----------------------------------|-----|
| | | | | | | £ s. d. | | £ s. d. | |
| 1 | Wheat . | { 60 lbs. of corn 120 " straw | 1.09 lbs. .67 " | .49 lbs. .29 " | .31 lbs. .69 " | 0 1 10½ | 24 bush. | 2 5 0 | 1 |
| 2 | Oats . | { 42 " corn 63 " straw | .79 " .28 " | .28 " .17 " | .17 " .74 " | 0 1 1½ | 48 " | 2 14 0 | 2 |
| 3 | Barley . | { 52 " corn 65 " straw | .87 " .46 " | .49 " .08 " | .22 " .61 " | 0 1 4¾ | 40 " | 2 15 10 | 3 |
| 4 | Lea Hay . | One Ton | 53.00 " | 12.40 " | 37.00 " | 2 14 2½ | 2¼ tons | 6 1 11½ | 4 |
| 5 | Meadow Hay . | " | 29.00 " | 9.50 " | 45.00 " | 1 14 7½ | 2 " | 3 9 3 | 5 |
| 6 | Potatoes . | " | 8.04 " | 3.20 " | 10.18 " | 0 9 4¾ | 7½ " | 3 10 5½ | 6 |
| 7 | Swedes . | " | 4.80 " | 1.33 " | 4.45 " | 0 5 1¼ | 20 " | 5 2 1 | 7 |
| 8 | Mangolds . | " | 5.50 " | .93 " | 5.20 " | 0 5 9 | 25 " | 7 3 9 | 8 |
| 9 | Carrots . | " | 4.50 " | 1.33 " | 5.10 " | 0 4 11½ | 12 " | 2 19 6 | 9 |

The "Chemical Balance-Sheet" idea practically absurd.

our farm. The manure account includes that applied the preceding autumn:—

| | | | | |
|---|---|-------|----|---|
| Value of the Nitrogen, Phosphoric Acid, and | } | £1548 | 11 | 6 |
| Potash removed by the Crops, . . . | | | | |
| Value of Manure applied, . . . | | 1534 | 5 | 4 |
| Balance against the Land, . . . | | £14 | 6 | 2 |

It was self-evident that this estimate could not be practically true, and that £4 6s. per acre of manure could not be required every year to meet the drain of ordinary farm cropping.

It was then considered, that as the rain, &c., furnishes every year an amount of nitrogen sufficient for a small crop, this natural supply should be deducted from the estimate. But when the amount of this natural supply, was calculated from the yield of the unmanured crops obtained in our experiments, its deduction, on the other hand, promised to give too much for unexhausted manures; for instance, from the Lea hay estimate, it took off £3 7s., and from the above estimate, £732; giving a balance in favour of the land, of £718;—a sum quite as absurd as the other.

In this dilemma the chemist fell back upon the old arbitrary estimates of the early cropping sheets; which, being the work of three farm bailiffs (all practical men), were likely to be, at any rate, the least open to objection. These he modified a little, where later experience had suggested modifications; and, finally, the valuations given on page 303, in the last column but one, were adopted by the council. The minute fractions of the acreage column, are only approximately given as $\frac{1}{4}$, $\frac{1}{2}$, &c. In the Land and Valuation columns, "before any sum, means that it represents a deficiency.

The last column, added and balanced, shows the land £38 worse at the end of 1869, and £252 better at the end of 1870. (For the latter year the balance-sheet shows £400; this sum including besides, about £130 for Sheep manure and £16 for the Garden land.) These estimates were, I think, quite within the mark, when it is remembered that in 1869 the manure and lime alone cost about £650, and in

Valuations adopted for Unexhausted Manures and Tillages.

TABLE VI.—VALUATIONS ADOPTED IN 1869 AND 1870 FOR THE UNEXHAUSTED MANURES AND TILLAGES.

| No. | KIND OF CROP. | Year. | Cultivation. | Manure. | Land Better or "Worse per Acre. | Acreage under each Crop. | Valuation for or against each Crop. | No. |
|---|-------------------------|-------|--------------|----------|---------------------------------------|--------------------------------|---|-----|
| 1 | Barley . . . | 1869 | 50 18 2½ | 5 1 6 4 | 50 16 0 | 10 | 57 18 0 | 1 |
| 2 | " . . . | 1870 | 0 5 3 | .. | .. | 1½ | .. | 2 |
| 3 | Carrots . . . | 1869 | 5 3 3 | 4 18 7½ | 0 10 0 | 6 | 3 1 3 | 3 |
| 4 | " . . . | 1870 | 7 8 2 | 10 12 9 | 4 0 0 | 1½ | 5 9 4 | 4 |
| 5 | Flax . . . | 1870 | 3 6 11½ | .. | .. | 4½ | .. | 5 |
| 6 | Italian Rye-grass . . . | 1869 | 0 2 1½ | 0 6 11½ | 0 17 0 | 4½ | 4 0 9 | 6 |
| 7 | Lea Hay . . . | 1869 | 0 6 11½ | 1 6 1 | 11 9 0 | 57½ | 83 11 1½ | 7 |
| 8 | " . . . | 1870 | 0 4 11½ | 3 12 0½ | 0 14 0 | 77½ | 52 10 0 | 8 |
| 9 | Meadow Hay . . . | 1869 | 1 2 8½ | .. | 12 0 0 | 4½ | 18 10 0 | 9 |
| 10 | " . . . | 1870 | 0 19 11 | 3 10 0 | 0 11 0 | 6½ | 3 14 0 | 10 |
| 11 | Mangold . . . | 1870 | 3 13 5½ | 9 7 2½ | 2 0 0 | 2 | 3 16 0 | 11 |
| 12 | Oats (Canadian) . . . | 1869 | 0 16 5½ | .. | 11 15 0 | 3½ | 16 2 6 | 12 |
| 13 | Oats (Common) . . . | 1869 | 1 4 9 | 1 10 10½ | 11 9 0 | 76 | 110 0 4½ | 13 |
| 14 | Oats . . . | 1870 | 1 2 3½ | 2 10 3½ | 10 3 0 | 15½ | 22 14 0 | 14 |
| 15 | Pasture Grass . . . | 1869 | 0 13 0½ | .. | 0 10 0 | 6 | 3 0 0 | 15 |
| 16 | " . . . | 1870 | 0 0 10½ | 4 5 1½ | 0 15 6 | 5½ | 4 4 6 | 16 |
| 17 | Potatoes . . . | 1869 | 4 6 11½ | 5 0 11½ | 3 0 0 | 38½ | 115 2 6 | 17 |
| 18 | " . . . | 1870 | 3 8 1½ | 8 3 2 | 2 9 3 | 66½ | 164 6 6½ | 18 |
| 19 | Swedes . . . | 1869 | 4 9 9½ | 2 15 4½ | 2 19 0 | 33½ | 98 9 1½ | 19 |
| 20 | " . . . | 1870 | 4 4 3½ | 3 8 5½ | .. | 7½ | .. | 20 |
| 21 | Wheat . . . | 1869 | 2 6 8½ | 2 14 2½ | 11 1 0 | 44½ | 46 9 3 | 21 |
| 22 | " . . . | 1870 | 1 9 4½ | 5 1 10 | 0 19 6 | 42½ | 41 8 0 | 22 |
| Balance against 1869—the Land being deteriorated | | | | | .. | .. | 38 17 7½ | |
| Balance in favour of 1870—the Land being enriched | | | | | .. | .. | 252 14 4 | |

Chemical Manures increasing the subsequent Crops for many years.

1870 about £1,500. In fact, the unexhausted manures and lime of 1870 are here valued at just about one-sixth of the cost of the manure, or one-ninth that of the tillage and manure together.

But, it may be asked, Did we leave the land better than we found it? To this question, I think, any impartial observer would give an unhesitating reply in the affirmative. The proofs of this are many. The land itself sold for about £7,000 more than its original cost; but then the expense of buildings, drainage, &c., more than counterbalanced this £7000; so that the manures may fairly count as nothing. The strongest proof is that given previously by the farming-accounts on page 165, which show, that the sales per acre, and, consequently, the fertility of the soil, had increased steadily every year up till 1871. Beginning with 1866, the sales of that year amounted to only £7 os. 9d. per acre; while those of 1870 reached £12 13s. 6d., and the average of the last six years £8 9s. 11d. These facts were quite unknown even to ourselves, until the preparation of this book, led us to examine and compare the financial returns of each year; and it is not improbable that, had we made these comparisons at an earlier date, we might have been farming and improving yet.

But again it may be urged, that we were simply forcing extra good crops in 1869 and 1870; and so exhausting the land. Well, if we did so, it was in ignorance, for our intention, evidently, was to improve the land. A glance at Table I. of this chapter will show that this was our intention; a greater value of manure having been applied in 1871 than in 1862 or 1865; or, indeed, any year except 1866. True, this was nearly all for chemical manures; but, on the other hand, these, as I will presently explain, were of a less stimulating character than ordinary farm-yard manure; containing a less proportion of nitrogen, and more of the actual soil constituents of the plant. Also, for proof that chemical manures operated beneficially on subsequent crops, I might refer to evidences in this book, did not the present agitation for "tenant right," compensation, &c., render it unnecessary. But, as an extreme instance of the subsequent good effects of a purely chemical manure, I may refer to plot 4 of Messrs. Lawes and Gilberts'

Our Reasons for Farming without Cattle.

continuous wheat experiments; which, for more than twelve years, has given a heavier yield than plots 3 or 20; and this, simply because of a previous seven years' manuring, with about 3 cwts. superphosphate and $1\frac{3}{4}$ cwts. of sulphate of ammonia. Now, the manures applied by us, in 1870, contained about 80 tons of superphosphate, and those of 1871 nearly 90 tons, besides much muriate of potash and other salts.

Of course, the great majority of farmers will say, that still, the land must have been deteriorating; seeing that the crop was all sold off, and no farm-yard manure returned to the soil. This objection is at present a lawful one; but its justice must be judged of, by the light of time. There are, however, a few facts brought out by our cropping sheets, in reference to an adjacent, or, rather, an interlying farm, which tell here not a little in our favour. In 1870 we acquired this farm, which had been in the hands of a tenant-farmer, with a lease of fourteen years, three or four of which were then to run. But when we, having bought him out, began to crop his land, nearly every field of it proved much inferior to our own land; though, as a rule, they had got more manure. Of this, field 8, in cropping sheet No. 4; field 7, in sheet No. 7; and field 7, in sheet No. 8, are instances.

That we were justified in trying to farm without cattle, I think few of our readers will doubt, if they examine the cattle balance-sheets on pages 170 and 171; but it will not be out of place here, to give a few of the ideas and facts which induced us to hazard this unusual experiment. The first reason undoubtedly was, that already at least £5000 had been lost in cattle feeding; and we thought a change could scarcely be for the worse. Then as theoretical and practical vegetarians (fruit and grain eaters), we were not unwilling to attempt vegetarian farming. The possibility of it was also already assured, for clay land at least, by Messrs. Lawes and Gilberts' experiments on the growth of wheat for nearly 30 years on the same piece of land;—an average annual produce of between 30 and 40 bushels per acre, having been obtained by the use of purely chemical manures. Their experiments show also similar results for barley and hay; and

Our Experience of Farming without Cattle.

have demonstrated that, under rotation, results more practical were obtainable. To go farther into these experiments would be out of place here; but in the Journals of the Royal Agricultural Society of England, Messrs. Lawes and Gilberts have given very full details; without, however, advising the use of none but chemical manures, or even claiming profitable results. These experiments showed us, at any rate, that the question was less one of possibility than profitability; the difficulties being practical, rather than natural.

Our own experiments, were at the time, much too young to be of any service in deciding the question. As it was, we began much too rashly, and without any definite plan or system. The results show, however, amongst many mistakes, a decided improvement on our early farming; due, perhaps, more to better management than to our own systemless mode of farming. Indeed, although latterly our farming paid, for one or two years, we can hardly claim to have succeeded in farming either with or without cattle; nor can we say that we see our way yet to managing a light land farm without cattle. But this we do claim,—and here our Cropping Sheets bear us out,—namely, that the experience of some fields, and notably that of Mid-heads, shows no deterioration after six years' cropping without farmyard manure, although chemical manure was applied for every crop. Our experience also suggests that on most light soils, no rotation which excludes farmyard manure, will answer, unless the organic matter of the soil is kept up; either by a frequent hay crop, or by the ploughing in of an occasionally green crop, or some other such method. But our experience is much too short, to warrant any decided opinion upon the question, of the possibility of farming light land without cattle.

On clay land a very interesting experiment on this question is now in progress at Sawbridgeworth, Herts. The following extracts from a paper by Mr. Edmund Ruck, read before the Cirencester Chamber of Agriculture, will explain the experiment. The report has been taken from the *North British Agriculturist* of 9th December, 1868; and I may add that in the autumn of 1873 (after ten years' experience) Mr. Prout reports it still successful.

A Clay-land Farm Thirteen Years without Live Stock.

[Mr. Ruck read from the 3rd vol. of the *English Agricultural Society's Journal* (new series), p. 121, the account there given of Blount's Farm, Sawbridgeworth, Herts, a stiff clay farm, of which he then proceeded to speak.]

"When I went over the farm a short time since with several friends, we found it answering to this description, being perfectly clean and in an excellent mechanical state. Mr. Prout has been in the habit of selling by auction everything he grows on the farm, and I hold in my hand his catalogue of this year's sale. The corn sold grew on 378 acres, the purchaser taking it as it stood in the field, and having to cut and harvest the crop. The total amount realised by the sale was £4848 10s.; this sum included £308 for hay—£112 of which was for old hay. You must bear in mind, that there is a very small amount of capital required, to carry on a farm on this principle. There being no stock, little manual labour is required. The whole live stock on the farm, when I was there, consisted only of six cart horses and one milking cow. I must tell you that when I was at the farm, I met many leading agriculturists of that neighbourhood, whose opinion it had been that Mr. Prout must come to grief after growing three corn crops in succession; but they now think differently, and acknowledge that there is a quarter more corn grown on this farm now, than the general average of the district. And the farm, which was let eight years ago at 23s. per acre, is now worth 46s. You must bear in mind that *Mr. Prout has never used one load of farmyard manure* on the 400 acres of his farm; and what astonished me most was the percentage capital will pay if strong land is farmed on this plan.

"During the discussion which followed, Mr. Ruck said that Mr. Prout used about £640 worth in the first four years, but he did not use artificial manures now to any great extent. What he did use was a kind of mineral phosphate, which he bought for about £15 or £16 per ton, ready prepared. It was a fact that five wheat crops had been taken in succession, and he never saw such splendid straw in his life; some of it, he believed, was sold for £3 10s.

"Mr. Prout never had had one sheep on his farm since he

Present Condition of Blennerhasset Farm.

purchased it. He tried the cattle one season, but he found that horned stock did not pay; and he did not feel inclined afterwards to try the fleecy stock, and therefore he never had any stock at all. As to the artificial manure, there are 400 acres on the farm which had never had any manure upon it since Mr. Prout had been there."

Still more recently, in a letter to the *Times* on the crops (July, 1874), Mr. Thomas Scott said of Mr. Prout's farm:—"I have visited Mr. Prout's farm, in Herts, and Mr. Middleditch's, in Wilts, where deep steam cultivation is substituted for live stock and manure, and I must say that their wheat crops surpass anything I have seen or heard of this season. Mr. Prout has had no live stock on his farm for 13 years, and Mr. Middleditch for four, and on Monday the latter sold nearly 500 acres of wheat at £11 an acre on an average, some reaching £17 5s. Either of these gentlemen might challenge England for wheat crops, and, though this may not induce landlords to relax prescriptive—I may almost say restrictive—clauses in their leases in favour of enterprising and intelligent tenants, it should at least make them and their advisers think."

This question is one that time alone can decide. The rentals of the three farms, when Mr. Lawson entered upon them, averaged less than 30s. per acre; and now it cannot be worth much less than 45s. per acre. We sold the farm in 1871; and now, in the autumn of 1873, the present bailiff reports that, as regards the *manurial* condition of the land, he has no complaint to make. Some, too, of the old hands, who, in our reign, suspected the chemical manures of impoverishing the land, now say that "the new folk" have put nothing into it, and yet are getting good crops out of it. To give, however, an impartial view of this, we insert the following letters; the first of which was addressed by us to a neighbouring tenant farmer, who had freely criticised our doings in the weekly parliaments and in conversation:—

"DEAR SIR,—In view of the system of manuring latterly adopted on the Blennerhasset Farm, it is an interesting question as to how far the soil seems to have been improved

How much Compensation for Unexhausted Manures?

or impoverished by it. And as you have known it by hearsay, before we acquired it in 1862; and since, by frequent personal observation, both when in our hands, and now, for two years in those of another: you cannot but have a very fair idea as to its present condition. I would therefore esteem as a favour your opinion on the following points:—

- “1st, Do you think that our ten years’ farming has increased the productive power of the soil?
 “2nd, As a tenant farmer, and acquainted with farming land as usually left at the end of a tenancy, would you say that our farm was left in poor manurial condition, or otherwise?
 “3rd, Do you think that, under a just land law, we would have been entitled to compensation for unexhausted manures?
 “4th, How much would you have felt entitled to if, during the last year of your tenancy, you had applied to 382 acres £1,481 worth of manure, as below:—

| | | |
|--------------------------------------|----------|---|
| Sulphate of Ammonia, | 33 tons. | } And £1,448 worth the year before. |
| Superphosphate (27.8 per cent.), | 86 „ | |
| Muriate of Potash (80 per cent.),... | 14 „ | |
| Salt,..... | 7 „ | |
| Gypsum,..... | 5 „ | |
| Farm-yard Manure, | 89 „ | |

Remembering, however, on the other hand, that you left only a small dung heap, valued at £24.

“But for the interest you have all along taken in the farm, I should not have ventured thus to trouble you, and trust you will excuse the liberty.

“Sept. 26, 1873.”

CHARLES D. HUNTER.

(Answer.)

“SIR,—Your four questions I will endeavour to answer honestly and fairly as between landlord and tenant;—trying in the meantime to forget, as far as possible, the relations between Mr. Lawson and his brother.

“I. I was not acquainted with the farm prior to its occupancy by Mr. Lawson, but have often heard that it was one

A Tenant-Farmer's Opinion about the Farm.

of the best farms in the neighbourhood and well farmed;—at least as the old-fashioned idea of good farming was at that time known. And, while I am ready to admit that Mr. Lawson's mode of cropping and manuring was much more productive than that of his predecessor, yet I fear the continuous cropping was so exhaustive, and the constant deep grubbing of such light porous soil so absorbing, that it must be a question for time to unravel whether or not any real improvement has been effected—I mean in a manurial point of view. I think, however, that few will be found to question the great benefit to be derived from the grubbing out of so many old crooked fences, the levelling and preparatory process for re-forming new fences, and many other lasting improvements.

“II. In looking over the farm this autumn, I was pleased to find the part now in grass looking so well; but the corn and turnips were far from what I expected. No doubt, much plant food put into the soil is either wasted or unasimilated; and from the fact that the grass seems to progress more than either corn or turnips, it is more than probable that too much corn and too little grass have been grown, and that a change of crops may prove more remunerative; while, no doubt, the land will be better for the rest.

“III. An arbitrator, under a just land law, would, no doubt, set down something considerable for unexhausted manures; but he would also have to take into consideration the ‘per contra’ of the ledger; he would have to consider the wholesale removal of the vestures, the over-cropping of the farm, the total want of muck producers, the foul state of the land, and various other matters:—and I have some doubts whether in your case the balance would not be on the wrong side.

“I don't forget what your fourth question states, that £1481 worth of manure has been put on the 382 acres; but the sum is made up principally of what is generally considered exhaustive manure, and of which the crops would take up the most part in the first year. For my own part, I should say the manure was misapplied, or rather over-applied. £4 per acre of forcing manures over the whole

Foul Condition of the Garden and part of the Farm.

farm, per year, would, one might reasonably expect, rather exhaust than improve the soil; and it may be a question, should any plant food, applied through the manure, be left in the soil, whether in such porous soil it may be available for next year's crop. Be this as it may, I am not in a position to state how much you would be entitled to under the circumstances. You will not fail to observe that your case in farming and mine are very different; my sole aim being to carry as much stock as possible, while yours is to carry none at all. The *stock system* would carry much more weight with honest arbitrators; and much more would be allowed for the same quantity of forcing manure under the stock system than the other; for the very reason that the combination of farmyard and the said forcing manures would produce very considerably more available plant food.

"Sept., 1873."

That *our constant and erratic cropping* made the land very foul there can be no doubt; but this was no fault of the manures. Indeed, the high garden land was in this respect very much worse than the farm land, although the garden land was, to the last, dressed with farmyard manure; the gardener being free to crop and manure as seemed best to him. This fact was brought prominently forward in the last discussions of the weekly parliament, when the subject of soil exhaustion was under consideration. It was, in fact, the main argument urged then against our systemless mode of constant cropping; and against the idea that the chemical manures were directly to blame for the foul condition of some fields. Indirectly they were to blame; as must anything which, while necessitating change, does not provide against all the drawbacks arising from such change. Experience alone can provide against such drawbacks; and as we chose unbeaten paths, we had our experience to buy.

Farmyard manure has, for some purposes, many advantages over an equivalent of chemical manure, and it has also many disadvantages. Chief among the latter is its great bulk. Professor Voelcker's two analyses of a good

Farmyard Manure more Stimulating than some Chemical Manures.

specimen show each ton to contain a great quantity of water, as the following table proves:—

| | Fresh Manure. | | | Well Rotten Manure. | | |
|----------------------------|---------------|------|------------------|---------------------|------|------------------|
| | Cwts. | Qrs. | Lbs. | Cwts. | Qrs. | Lbs. |
| Fertilising substances,... | ... | ... | 47 $\frac{3}{4}$ | ... | ... | 47 $\frac{3}{4}$ |
| Other materials,..... | 6 | 1 | 10 | 4 | 1 | 27 |
| Water,..... | 13 | ... | 26 $\frac{1}{4}$ | 15 | ... | 9 $\frac{1}{4}$ |
| | — | — | — | — | — | — |
| | 20 | ... | ... | 20 | ... | ... |

The disadvantage of carting 15 cwts. of water with each 47 $\frac{3}{4}$ lbs. of manure is very great, and especially so when the field is distant from the steading. For, before a dressing of 10 tons per acre can be applied to a field, say a mile distant, the carts have to go backwards and forwards at least sixteen times; and 8s. or 10s. is soon spent in the labour of applying to one acre 477 lbs. or 4 $\frac{1}{4}$ cwts. of real manure; which, abstracted from the bulk of refuse and water, would hardly have cost in the application as many pence.

Another disadvantage of farmyard manure is its liability to contain the seeds of weeds, derived chiefly from the bedding; and which, when the manure is spread upon the soil, often give much trouble. The third disadvantage is one that holds good for almost all crops but wheat, and is a fault of composition; the fact being, that farmyard manure, compared with most artificial manures, is too stimulating. This will seem to many practical men a paradox; it is, however, no mere theory, but a hard indisputable fact, forced upon us both by experience and analysis. Generally speaking, by a stimulating manure is meant a nitrogenous one, such as nitrate of soda, Peruvian guano, or sulphate of ammonia; and a feeding manure means one more phosphatic and mineral, such as bones, potash, salts, &c. Now, if we look at the average composition of farmyard manure, we find for every 100 lbs. of nitrogen only 75 lbs. of phosphoric acid, and 87 $\frac{1}{2}$ of potash; whilst for instance, in a potato manure, the proportions should be nearer 130 lbs. and 260 lbs. of the two minerals to every 100 lbs. of nitrogen. And if the reader will turn to Chapter XX., on "Experiments upon Potatoes with Potash Salts," he will find, in Series C, this

Farmyard Manure less Liable to be Washed into the Drains.

opinion confirmed by actual experience;—a three years' trial on potatoes with potash, salt, and lime, with a reduced dunging, having proved better by £3 per acre than a full dunging. Farmers, too, recognise this fact themselves, in applying generally only a half dunging for turnips, and adding some superphosphate to supply the deficient minerals. Indeed, in farming practice, this stimulating nature of farmyard manure is continually recognised and guarded against. Especially is this the case in the growth of flax, for which the manure must be applied *to the previous crop*, otherwise the flax would be inferior. In market gardening, too, this fact is appreciated and allowed for; autumn manuring in this case being common. For wheat, however, the proportions of farmyard manure are better, and to this crop it can be applied with the least waste, especially on light soils. Mangolds also utilise it well; and its autumn application to grass is highly useful.

The advantages of farmyard manure are, on the other hand, many; on heavy land it opens the soils so that it works easier and drains better, and the air gets readier into it. The carbonic acid, too, furnished by its decomposition, dissolves the insoluble soil compounds, rendering them more available for plant food. But on light land the 5 cwts. of decaying vegetable matter contained in each ton, is of still greater importance as a retainer of manures. Professor Voelcker, in a recent lecture before the Chemical Society, on "The loss of Plant Food by Drainage," gave numerous analyses of the drainage waters from Messrs. Lawes & Gilberts' wheat plots, which for about thirty years have been dressed with the same manures. Those analyses show a considerable loss of manure through the drains even from a clayey soil. From a light gravelly soil it must, therefore, be very much more. In getting his samples he had great difficulty with a plot dressed annually with 14 tons per acre of farmyard manure, "the drains being found to flow seldom more than once a year." At first they suspected some stoppage, but this was disproved; the fact being, that so sponge-like had the land become under this constant dunging, "that, when saturated, it retained 1½ inches (or about 150 tons per acre) more rainfall than

The Loss of Plant Food by Drainage.

some of the other plots."* And with this rain it retained the manures also.

Another advantage is the large supply of nitrogen it furnishes to the careful farmer. Every pound of nitrogen (in view of the present prices of nitrate of soda, sulphate of ammonia, and high-class guanoes,) is of great value; for what some years ago cost $7\frac{1}{4}$ d. per lb., is difficult now to purchase at 10d. And it is well to remember that the liquid manure is, in this respect, about five times richer than the solid; and should accordingly be more carefully husbanded.

Farmyard manure, as before mentioned, should, in consequence of its richness in nitrogen, be generally used for green crops only as a half dressing. Ten tons per acre of fair quality supply as much nitrogen as is useful for potatoes, swedes, &c.; and the deficient minerals should be added. For potatoes, say $1\frac{1}{2}$ cwts. muriate of potash, and $2\frac{1}{2}$ cwts. superphosphate; and for swedes, say 1 cwt. of the former, and 3 of the latter. In this way a better return will be obtained for the farmyard manure, both in quality and quantity; for a badly proportioned manure is wasteful, both in itself and in its effect upon the crop.

Perhaps another advantage of farmyard manure may lie in the warmth produced by its decomposition. This would be of use chiefly for swedes, as forcing them rapidly beyond reach of the fly. Another quality, but one of very doubtful value, though often claimed as an advantage, is the lasting quality of farmyard manure. Of course there are cases where it is wise to pay for this quality, as in laying down land for permanent grasses; but for general farming, is it not rather a disadvantage? and for three reasons: First, the outlay of unproductive capital involved; secondly, the danger of its loss by drainage; and thirdly, the danger of its economic loss by passing into an insoluble form. Upon the first point nothing more need be said, but the dangers of the second and third have forced themselves upon the observation of every observant farmer,

* Messrs. Lawes & Gilberts, in the Journal of the Royal Agricultural Society of England, for 1871, page 115.

Nitrogen in Chemical Manure more active than in Cattle Manure.

whether scientific or not; and are such as every farmer will recognise more and more, as he takes careful note of all that goes into his land, as compared with what comes out of it. Professor Voelcker, in the lecture before referred to, says, "I am inclined to think that at least three to five times as much of all the more important fertilising matters have to be put into the land, as is removed from it in the crops." And what becomes of the rest? Messrs. Lawes and Gilberts have analysed some of their soils, and say of the nitrogen not recovered in the immediate crop, "much remains in the soil in such a state of combination or distribution as to be extremely slowly recoverable by succeeding crops of the same description." Rotation certainly recovers more of this, and limeing also seems to release much of it from this locked-up condition; but analysis has shown the presence of vast stores of accumulated nitrogen in nearly all soils; stores which seemingly are of but little service to many crops.

Professor Voelcker's analyses of Messrs. Lawes and Gilberts' drainage waters show also a great loss of nitrogen in the drainage, a loss which, in cases when one-third of a rainfall of 30 inches passes through the soil, would amount to $22\frac{1}{2}$ lbs. of nitrogen per acre, value about 18s. 7d. From this it is evident that, other things being equal, *the manure which returns most in the first crop is the most economical*; and it is also evident that, though a farmyard manure may analyse to a value of 12s. 2d. per ton, it may, from many causes, prove worth not one half of this.

Some important facts bearing on this point will be found in Messrs. Lawes and Gilberts' papers on the growth of barley, &c., in the Journal of the Royal Agricultural Society of England, 1873, pages 89 and 275. Their experiments, continued now for nearly 30 years, show that out of every 100 lbs. of nitrogen supplied in the manure, only $14\frac{1}{2}$ lbs. were recovered in the wheat crop, when farmyard manure was used; and only $10\frac{3}{4}$ lbs. in the barley crop: whereas, when nitrate of soda was used, about 45 lbs. of the nitrogen were recovered in the wheat crop; and when ammonia salts were used, about 30 lbs. in the wheat crop, and nearly 50 lbs. in the barley: or, roughly speaking, the nitrogen of the

A Stock Farm Lighter on the Soil than a Crop Farm.

chemical manures was worth three times as much as that of the farmyard manure. It must, however, be allowed that these results were obtained under the disadvantage of continuous white crops; and that, with rotation, farmyard manure would in all probability show comparatively much better.

For such facts, however, many of the so-called artificial manures might be styled the natural manures; as being more readily of service to the plant. Nitrate of soda and superphosphate are instances of this, that will readily suggest themselves to every farmer; and with a little observation, the list will soon extend itself.

Another advantage of farmyard manure, or rather of the system which produces it, is the small quantity of fertilising matters which are thus sold off the farm. (Indeed, the money-value of all the sales is less per acre; a disadvantage in some respects.) In the following table, the loss to the soil of fertilising matters, when mutton and milk only are sold off the farm, is shown; and also the loss on a purely crop-farm, taking oats and potatoes as typical crops. It is somewhat difficult, however, to estimate accurately the loss of nitrogen, the amount of this expired by animals being a vexed question that we cannot now go into. Consequently, the figures for nitrogen placed opposite mutton and milk may be too high or the reverse. The amounts of nitrogen actually recovered in the produce are—for milk 12·8 lbs., and for mutton 4·03; about an equal amount being estimated as lost in respiration. For mutton the potash seems also at first sight excessive, but 4 lbs. are recoverable from the wool alone.

TABLE VII.—FERTILISING MATTERS REMOVED PER ACRE
BY SAME CROPS.

| Kind of Crop, and Amount. | Phosphoric Acid. | Potash. | Nitrogen. |
|--|---------------------|---------|-----------|
| Oats, 48 imp. bushels, - | 13½ lbs. | 8 lbs. | 38 lbs. |
| Potatoes, 7½ tons, - | 24 „ | 76½ „ | 60½ „ |
| Mutton (from 20 tons of Swedes), - - - | 3½ „ | 4½ „ | 10 „ |
| Milk 1,933 lbs., (3 acres per cow), - - - - | 3 „ | 1¾ „ | 23¾ „ |

Farming from a Social Economic Point of View.

Looking only at the amounts of phosphoric acid and potash, the advantage of the stock farm is evident, the average value of the quantities removed in milk and mutton being 1s. 6¼d. per acre; whilst that of the oats and potatoes is 12s. 10½d. Including the nitrogen, this difference would be greater still; but it is usually woefully reduced by the almost universal waste of the cattle manure by drainage from the middens.

There is, however, another side to this question, which demands a few words in passing; though it is more a national than a farmer's question. It is—What amount of food per acre is obtainable under the different systems? Adopting, as the basis of comparison, Dr. Frankland's determinations of the amount of muscular force obtainable from various foods; and for the weekly rations, Dr. E. Smith's inquiries into the dietaries of the working classes; we find that the relative food-supplying power of 100 acres under different crops is as below. The weight given for mutton is exclusive of offal, but inclusive of all the carcase fat, which forms about one-third of the total weight.

TABLE VIII., SHOWING THE NUMBER OF MEN CAPABLE OF BEING MAINTAINED ON 100 ACRES UNDER DIFFERENT CROPS.

| Kind of Crop, &c. | Weight of Produce per 100 Acres. | Number of Men supported for 52 weeks. |
|---|----------------------------------|---------------------------------------|
| Mutton from 20 tons per acre of Swedes, - - | 26,000 lbs. | 41¾ men. |
| Milk, 3 acres to one cow, | 193,300 „ | 53 „ |
| Wheat, 25 imp. bushels, - | 150,000 „ | 250 „ |
| Potatoes, 7 tons 3 cwts per acre, - - - | 715 tons. | 683 „ |

Goldsmith speaks of the time “when every rood of land maintained its man;” but unless the land was very good, potatoes must have been the main diet, as they alone come up to that mark; one acre nearly supporting seven men. Wheat and the other grains sustain about 2½ men per acre, but the introduction of milk or mutton reduces this greatly;

Why Britain is a Grain-importing Country.

so that, even with our modern green-crop system, four roods cannot maintain half a man, when mutton is taken as the measure of his sustenance. The above differences—ten to one against the stock farm—explain, along with the increase in population, why we are now so largely a grain-importing country: for the consumption of flesh meat has increased far out of proportion to that of the population; and for every acre turned from wheat and potato-growing to the production of flesh meat, the produce of nine acres of grain, &c., has to be imported from other countries. To the farmer individually this is of perhaps little importance, or to the nation either in times of peace; but war with a maritime nation might at any time make it a question of life and death.

The Wage Expenditure and General Account.

CHAPTER XVIII.

FARM LABOUR AND ITS COST.

THE subject of the agricultural labourer is especially interesting at the present time. In this chapter it is shown that, during three years, our labour bore the proportion of one-fifth to the total cost of production. There is also given our annual expenditure on farm labour, and the cost of boarding servants at the steading. The cost of horse labour is also detailed, including the food, the smithy, saddlery, and implement expenditures.

The manual labour of the farm was a very heavy, and as will presently be seen, a very variable amount. After 1866, the wages of the farm-bailiff, clerks, and those employed about the cattle, gardens, flaxworks, &c., were kept quite separate from the farm labour proper; so that only the crop-producing and crop-preparing wages were, with a few evident exceptions, charged as farm wages. From this period, therefore, the annual expenditure on wages, if divided by the acreage of each year, will furnish a very fair indication of our progress or otherwise in economical farming. To make the comparison complete, however, there must also be shown the annual wage charge against the farm for management, and other matters, included in what was called the General Account, to which was charged the bailiff's and clerks' wages, and part of the chemist's; and also all expenditure connected with buying and selling, rates and taxes, and other minor general charges: the total of which, at the end of each financial year, was spread over the different departments, according to their respective liabilities.

Annual Wage Expenditure at Blennerhasset.

TABLE I.—FARM WAGE EXPENDITURE PER ANNUM AND PER ACRE.

| Year. | Acre- age. | Manual Labour. | | General Account. | |
|---------|---------------|----------------|-----------|------------------|-----------|
| | | Per Annum. | Per Acre. | Per Annum. | Per Acre. |
| 1862-4 | 260 | £784 8 7 | £3 0 4 | £164 15 9½ | £0 12 8 |
| 1865 | 300 | 1240 7 8 | 4 2 8 | 122 19 9½ | 0 8 2½ |
| 1866 | 300 | 1519 6 7¼ | 5 1 3¼ | 282 9 11¼ | 0 18 10 |
| 1867 | 296 | 744 6 10 | 2 10 4 | 213 6 4½ | 0 14 5 |
| 1868 | 296 | 652 2 2¼ | 2 4 0½ | 276 16 7½ | 0 18 8½ |
| 1869 | 296 | 563 14 0 | 1 18 1 | 238 13 6½ | 0 16 1½ |
| 1870 | 382 | 700 0 5 | 1 16 8 | 259 15 6 | 0 13 7½ |
| 1871 | 380 | 683 16 9 | 1 16 0 | 282 6 2 | 0 14 10½ |
| 1872 | .. | 91 10 2 | .. | 216 10 7 | .. |
| Average | 303 | 845 14 0 | 2 17 0 | 217 1 0 | 0 14 3½ |

The above table shows, like that on page 165, a decided improvement from 1866 onwards, every year indicating a marked decrease in the amount expended per acre on wages. For, beginning with 1867, when the other departments were separated from the farm, the expenditure on manual labour, then at £2 10s. 4d. per acre, decreases steadily; so that in 1871 it stands at £1 16s. per acre; and this, too, with 78 more acres under potatoes than in 1867. As far as mere figures go, co-operation seems not to have been without effect on the labourers, so marked is this decrease in the cost of labour.

Our mode of farming necessitated more labour than is usual: and, through the kindness of a neighbouring and successful farmer, I am enabled to compare our wage expenditure with what may be taken as a fair sample of the average annual expenditure on farm labour in Cumberland. His farm consisted of 316 acres, 265 of which were arable, 35 meadow, and 16 old grass; and therefore not unlike our own in the extent of arable land. During the six years, 1864 to 1869 inclusive, to which period the figures apply, our neighbour's farming will more easily compare with ours

The Nine-Hours System Introduced.

than if a later period was included; as sheep and cattle were our chief production during the first four and a-half of these six years. Our neighbour's wages expenditure for the period mentioned was £2,015 13s. 8d., increased by the board of two lads and one girl (at 8s. per week) to £2,390 1s. 8d.; which equals £398 6s. 11¼d. per annum, or £1 5s. 2½d. per acre per annum. But perhaps a fairer comparison would be one based upon the arable acreage only. This gives for his farm £1 10s. ¾d. per acre; but for ours (including the wages of those employed in feeding and tending cattle) the expenditure was in 1867 £3 5s. 2d. per acre; and in 1869, £2 2s. 2d. per acre; a difference greater than was warranted by our extra acreage under potatoes.

But our constant cropping would also tend to make our wages higher: for a glance at the Cropping list, on page 225, will show that it was our custom to break up the lea after taking the first hay crop, whereas at least one year's grazing after hay is the custom in Cumberland.

But, all things considered, it is still evident that our farm labour was at least one-half too costly in 1867, and probably much more so previous to that year; and it is also evident that towards the end of our farming we had greatly improved in this respect; co-operation doubtless helping towards the improvement.

During our ten years' farming, the number of labourers employed varied considerably, especially in the earlier years, when building and draining were in progress. Indeed, it is on record that in March, 1862, when we had only 260 acres of land, 120 men were at work on the buildings, drains, and farm.

In 1867, Mr. Lawson introduced the nine hours system, ten and a-half having been the number before; and it is noteworthy that the labourers did not at first approve of the change, although they afterwards strenuously resisted an attempt to lengthen the day's work by half an hour.

As a specimen of the rate of wages then prevailing, a copy is subjoined of the farm wage sheet for one week in April, 1870. It includes a considerable amount of broken time.

Extra Labour for the Potato Harvest.

TABLE II.—DETAILED FARM WAGES FOR ONE WEEK IN APRIL, 1870.

| | | | | | | | |
|-------------|-------|--------|--------------|----------------------|-----|----|------------------|
| 1 | Man | at 3s. | 2d. per day, | 6 days, | £0 | 19 | 0 |
| 2 | Men | „ 3s. | „ | 12 „ | 1 | 16 | 0 |
| 2 | „ | „ 2s. | 10d. | „ 7 „ | 0 | 19 | 10 |
| 1 | Man | „ 2s. | 9d. | „ 6 „ | 0 | 16 | 6 |
| 4 | Men | „ 2s. | 8d. | „ 17 „ | 2 | 5 | 6 |
| 3 | „ | „ 2s. | 6d. | „ 8 „ | 1 | 0 | 0 |
| 1 | Man | „ 2s. | „ | 6 „ | 0 | 12 | 0 |
| 9 | Women | „ 1s. | 3d. | „ 53 $\frac{3}{4}$ „ | 3 | 6 | 11 $\frac{1}{2}$ |
| 1 | Boy, | „ 1s. | 3d. | „ 6 „ | 0 | 7 | 6 |
| 1 | Girl, | „ 1s. | „ | 4 „ | 0 | 4 | 0 |
| 25 persons. | | | | | £12 | 7 | 3 $\frac{1}{2}$ |

This shows a weekly expenditure of £12 7s. 3½d. for manual labour; and as the yearly wages varied from about £600 to £700, the above may be taken as an average week. The summer weeks generally showed less, and the harvest weeks more.

Female labour was generally paid for at about half the male rate. We employed many women,—£217 being paid in 1870 for female labour, out of a total of £700 os. 5d.; and from this it appears that just about as many women as men were employed, allowing for the difference of wages.

In harvest time the women were paid double wages; but of the men, only extra hands were paid 6d. or 1s. per day beyond the ordinary rate.

In 1870, when the large acreage under potatoes, and the heavy weight of that crop, required many extra hands, the time-book shows for the week ending October 21st, that 22 men, 20 women, 12 boys, and 11 girls were employed. This fully doubled the farm wages, making that week's £25 1s. 3½d.; but it more than doubled the number of hands, 65 persons being employed on the farm. If to this we add the other departments, the total number then employed was 83. The total wages paid for this week in October amounted to £42 12s. 5d., a sum not much above the general average; because, although the farm wages of that week were more than

Total Wage Expenditure of an Average Week.

doubled, the steam plough and manure departments were quiet. The total wages for the week in April, before referred to, were £41 5s. 9½d.; the steam plough at that time working a double shift, and employing 15 persons. The main details were as follows:—

TABLE III.—WAGES PAID FOR ONE WEEK ENDING APRIL 2, 1870.

| | | | | | |
|------------------------------|-----|-----|-----|----|----|
| Bailiff and Wife, | ... | ... | £1 | 10 | 0 |
| Chemist, | ... | ... | 2 | 2 | 0 |
| Clerk, ... | ... | ... | 1 | 6 | 6 |
| Timekeeper, | ... | ... | 0 | 14 | 10 |
| Two Joiners, | ... | ... | 2 | 3 | 0 |
| Smith, ... | ... | ... | 1 | 4 | 5½ |
| Groom, ... | ... | ... | 0 | 16 | 0 |
| Gasman, | ... | ... | 0 | 15 | 8½ |
| Reading Room, | ... | ... | 0 | 1 | 0 |
| Fifteen Men at Steam Plough, | | | 12 | 15 | 0 |
| Garden Wages, | ... | ... | 1 | 10 | 0 |
| Two Wallers, ... | ... | ... | 1 | 19 | 0 |
| Manure Works, | ... | ... | 2 | 1 | 0 |
| Farm Wages, ... | ... | ... | 12 | 7 | 3½ |
| Total, ... | | | £41 | 5 | 9½ |

It is interesting, in view of the recent wages agitation among the agricultural labourers, to see what foundation there is for the assertion, that any increase in the cost of farm labour means an equivalent increase in the price of food. The proportion which labour bears to the cost of production can be easily calculated from our Balance-sheet and Cropping-sheet figures of 1870. The farm wages of that year were £700 os. 5d. But, as part of the cultivation was performed by steam, something must be added for labour on that head. The charge for steam cultivation was £266 12s. 8d., of which the wages constitute nearly 40 per cent., or £106 12s. 10d.; which, added to the £700, gives a total of £806 13s. 3d. for manual labour. Its place in the total cost was as follows:—

Manual Labour forms One-fifth the Cost of Food Production.

TABLE IV.—TOTAL EXPENDITURE ON THE CROPS IN 1870
ON 382 ACRES.

| | Total.* | | | Per Acre. | | |
|----------------------------------|---------|----|----|-----------|----|-----|
| Manual Labour, | £700 | 0 | 5 | £1 | 16 | 8 |
| Horse Labour, | 440 | 16 | 6 | 1 | 3 | 1 |
| Steam Cultivation and Thrashing, | 266 | 12 | 8 | 0 | 13 | 11½ |
| Seed, | 337 | 8 | 7 | 0 | 17 | 8 |
| Manure and Lime, | 1,526 | 10 | 5½ | 3 | 19 | 11 |
| Rent at £2 per Acre, | 764 | 0 | 0 | 2 | 0 | 0 |
| Interest at 5 per cent. on £10 | | | | | | |
| per Acre of Farming Capital, | 191 | 0 | 0 | 0 | 10 | 0 |
| Rates and Taxes, about ... | 67 | 0 | 0 | 0 | 3 | 6 |
| | £4,293 | | | 8 7½ £11 | | |
| | | | | 4 9½ | | |

On the above total cost of about £4,293, a simple calculation shows that the manual labour (including that in steam cultivation) amounted to only $18\frac{3}{4}$ per cent. And, therefore, that every 1s. increase on a wage of 16s. per week (the average labourer's wage in Cumberland) would increase the cost of food only about $2\frac{1}{2}$ d. in the £1. But the above cost is exclusive of the management expenses and other extras. It would therefore be more correct to take the amount received for the crops, as the cost price of the farm produce. By doing so we can also include the returns of 1868 and 1869 in our calculation, which will modify the over-favourable figures of 1870; that year having been fertile beyond the average. Taking, then, for these three years, the farm wages, with 40 per cent. of the charge for steam cultivation and thrashing, we get a labour bill of £2,154; which calculated into £9,836, the money returns for the crops, gives 21.9 per cent. as the proportion of labour in the total cost of production. This amount equals nearly one-fifth, and every 1s. increase on a wage of 16s. per week would increase the cost of production only about $3\frac{1}{4}$ d. in the £1.

The amount of labour varied much, of course, for different

* These figures do not agree with the Balance-sheet of 1870, which includes the autumn expenditure on cultivation and on the wheat crop of the following year, 1871.

Acreage Expenditure on Labour for various Crops.

crops ; but as rotation of crops is necessary to good farming, the average of all should be charged equally against each. The following statement will be useful as indicating generally these differences. It includes the manual and horse labour, steam cultivation and thrashing:—

TABLE V.—TOTAL COST PER ACRE FOR LABOUR OF ALL KINDS ON THE CHIEF CROPS IN 1870.

| | Total Labour. | Labour per Acre. |
|-----------------------|---------------|------------------|
| Oats,.....151½ acres, | £577 14 6½ | £3 16 3 |
| Lea Hay,..... 77¼ „ | 111 13 10½ | 1 8 11 |
| Potatoes,..... 66¾ „ | 454 17 5½ | 6 16 3½ |
| Wheat, 42¾ „ | 143 3 3 | 3 6 11¼ |
| Swedes (1869), 33½ „ | 195 1 10½ | 5 16 5½ |

Swedes have been introduced from 1869, as in 1870 the acreage was small. Potatoes, it will be observed, required about £1 per acre more labour than swedes ; but, as a rule, they cost £2 more ; the extra cost on swedes in 1869 being for the carting home and storing of about one-eighth of the crop. The details of these have already been given in the Cropping Sheets.

It is still customary in Cumberland to board many, or all, of the farm servants in the house, they being engaged by the half-year. At first Mr. Lawson had many of his labourers engaged on these terms : but when the new steading was occupied in 1864 the system was discontinued. In 1867, under the second farm bailiff, it was again re-commenced ; and though this bailiff left in 1868, a few men were still boarded into 1869. About this time a return was made to the weekly parliament of the cost of keeping these hired men. The subjoined is a copy of the return then produced ; it extends over the eight weeks between March 11 and May 6, 1868. For better comparison, the cost per head per week has been calculated, by dividing each sum by 58, there having been five men and two women boarded during these eight weeks, and one man for two weeks.

Cost of Boarding Hired Servants at Blennerhasset.

TABLE VI.—BOARD OF HIRED SERVANTS IN 1868.

| | | | | Per Head per Week. | | |
|-----------------|-----|-----|----------|--------------------|----|-----|
| | | | | Eight Weeks. | | |
| | | | | s. | d. | |
| Flour and Meal, | ... | ... | £6 16 9 | ... | 2 | 4½ |
| Mutton, | ... | ... | 9 1 4 | ... | 3 | 1½ |
| Bacon, | ... | ... | 2 2 8 | ... | 0 | 9 |
| Milk, | ... | ... | 2 14 8 | ... | 0 | 11¼ |
| Butter, | ... | ... | 0 16 0 | ... | 0 | 3½ |
| Tea, | ... | ... | 0 13 4 | ... | 0 | 3 |
| Sugar, | ... | ... | 0 9 7½ | ... | 0 | 2 |
| Rice, | ... | ... | 0 2 10 | ... | 0 | 0½ |
| Currants, | ... | ... | 0 1 8 | ... | 0 | 0¼ |
| Yeast, | ... | ... | 0 1 4 | ... | 0 | 0¼ |
| Mustard, | ... | ... | 0 0 8 | ... | 0 | 0 |
| Peas, | ... | ... | 0 0 6 | ... | 0 | 0 |
| Treacle, | ... | ... | 0 0 5 | ... | 0 | 0 |
| Soap, | ... | ... | 0 6 2½ | ... | 0 | 1¼ |
| Blacking, | ... | ... | 0 0 9 | ... | 0 | 0 |
| Teapot, | ... | ... | 0 1 6 | ... | 0 | 0¼ |
| Total, | ... | ... | £23 10 3 | ... | 8 | 1¼ |

3s. 10d. per week for butchers' meat alone is, I am afraid, a very unusual allowance for farm servants; and evidently our expenditure on this head cannot be taken as a sample of what prevails in Cumberland. There is still, however, attendance and coals to add to the above. The dairymaid received 5s. 9d. per week, or, including board, 13s. 10½d.; and the girl 11s. 8½d. Of the dairymaid's time, three-eighths were charged for cooking, &c., for the men; and of the girl's three-fourths, making a total of 14s. 0¼d.; which, divided by 8¼, gives 1s. 8½d. per head per week additional. Then the coals cost 4s. 7d. per week, or 7d. per head, additional. The men were hired by the six months, at an average rate of £11 15s.; so that their actual weekly wages were as follows:—

| | | | | |
|-------------|-----|-----|-----|----------|
| Wages, | ... | ... | ... | £0 9 0½ |
| Food, | ... | ... | ... | 0 8 1½ |
| Attendance, | ... | ... | ... | 0 1 8½ |
| Firing, | ... | ... | ... | 0 0 7 |
| Total, | ... | ... | ... | £0 19 5½ |

Food of Twelve Horses for One Year.

The hired men thus cost us about 3s. 6d. more per week than the day labourers; a difference that led to our giving up this system soon after the production of the above return.

The horse labour has been referred to as being charged at 3s. 9d. per horse per day. The actual cost was, however, less—some years, at any rate;—as will be seen from the following statement of the horse-keep at the Blennerhasset Farm in 1870. Of the barley and wheat used, all—and of the oats, some—were “hinder-ends.”

TABLE VII.—FOOD OF TWELVE HORSES IN 1870.

| | | | |
|---------------------------------------|------|----|-----|
| Oats, 1,059 imp. bushels, ... | £135 | 12 | 1½ |
| Inferior Barley, 4½ imp. bushels, ... | 0 | 6 | 9 |
| „ Wheat, 22½ „ ... | 1 | 13 | 9 |
| Hay, 4,851 stones, ... | 126 | 1 | 6½ |
| Straw, 697 „ ... | 9 | 19 | 2 |
| Grass, 433 cwts., ... | 10 | 15 | 6 |
| Green Oats, 24¾ cwts., ... | 0 | 14 | 9 |
| Carrots, 1,422 stones, ... | 19 | 17 | 2 |
| Bran, 166½ „ ... | 5 | 9 | 6 |
| Oatmeal, ... | 0 | 4 | 4 |
| Grazing, ... | 5 | 14 | 10 |
| Salt, ... | 0 | 8 | 7½ |
| <hr/> | | | |
| Total Food, - - | £316 | 18 | 0½ |
| Shoeing, ... | £15 | 19 | 4 |
| Breaking, ... | 1 | 3 | 4 |
| Veterinary Account, ... | 6 | 19 | 2 |
| Hire, ... | 1 | 0 | 0 |
| <hr/> | | | |
| | 25 | 1 | 10 |
| <hr/> | | | |
| Total Cost, ... | £341 | 19 | 10½ |

During the year some horses were sold and others bought; but the total period to which the above applies equalled one horse for 621 weeks, or close upon 12 horses for the year. Each horse thus cost yearly £26 8s. 2d. for food, and £2 1s. 10d. for shoeing, &c.; or, for both, per week, 10s. 11½d. Then, as regards the working day, if we deduct Sundays, and allow 12 days for stormy weather,

Cost of a Farm Horse per Annum and per Day.

slack days, and sickness, we have 300 working days; which gives 1s. 10 $\frac{3}{4}$ d. as the cost of a horse per working day.

To this sum we must add something for tear and wear of horse flesh, for interest on first cost, and also the annual expenditure for carts, implements, and harness. The tear and wear is a difficult question. Our own horses finally sold for very much more than we paid for them, but prices had risen greatly. In the absence of anything more reliable, we may safely take the first cost of a horse old enough for work at say £42; which, allowing 14 years of work, gives £3 per annum for tear and wear. Then, interest on this, £42 at 5 per cent. per annum, gives £2 2s.; and both divided by the working days, gives 4d. per day.

Then, as to implements. Our ten years' expenditure on them amounted to £1,211; and, as what was left in 1872 sold for £343, the annual expenditure amounted to £86 16s. But from this something must be deducted for implements used only in hand labour, which may be taken at £16 16s. This would leave £70 to be divided over 10 horses (the number used for farm work); the result being 5 $\frac{1}{2}$ d. per working day.

Then there are the saddler's, smith's, and joiner's bills; which stand at £688 14s. 6d. for the ten years, or £68 17s. 5 $\frac{1}{2}$ d. per annum. Deducting from this the £15 9s. 4d. already charged for shoeing, we get £53 8s. 1 $\frac{1}{2}$ d.; which, divided over ten horses, gives £5 6s. 9 $\frac{3}{4}$ d. per horse per annum, or 4 $\frac{1}{4}$ d. per working day. And if we now add all together, we find the cost of our horse labour to be 3s. 0 $\frac{1}{2}$ d. per day. The details were as follows:—

TABLE VIII.—COST OF A FARM HORSE PER ANNUM AND PER DAY.

| | Per Annum. | Per Day. |
|----------------------------------|------------------------|----------------------|
| Food, | £26 8 2 | £0 1 9 |
| Shoeing, Veterinary, &c., ... | 2 1 10 | 0 0 1 $\frac{3}{4}$ |
| Tear and Wear and Interest,... | 5 2 0 | 0 0 4 |
| Implements, | 7 0 0 | 0 0 5 $\frac{1}{2}$ |
| Saddler's, Smith's, and Joiner's | | |
| Bills, - | 5 6 9 $\frac{3}{4}$ | 0 0 4 $\frac{1}{4}$ |
| Total, | £45 18 9 $\frac{3}{4}$ | £0 3 0 $\frac{1}{2}$ |

Manual Labour One-half the Total Labour.

As has been mentioned, each horse was charged 3s. 9d. per day; so that our Cropping Sheets are in this respect overcharged, but the error is at least on the safe side.

The horse labour, as has been shown, averaged in 1870 £1 13s. 1d. per acre; but if we include with it the steam cultivation, the two together just about equal the amount for manual labour. This furnishes a handy though rough rule for their separation, as our Cropping Sheet figures include the three in one sum.

The Value of a Manure depends on many Circumstances.

CHAPTER XIX.

EXPERIMENTS ON GRASS MANURING.

UPON grass for hay, upwards of a hundred and fifty experiments were tried, extending over five years, and embracing the questions of kind of manure and time of application. Twelve different manures were tested, used both alone and with each other; and some curious and interesting results were obtained.

The value of a manure was found to vary very much. The same quantity of salt, for instance, proved worth 2s. per cwt. when used in a particular manner; and, on the other hand, destroying 6s. worth of hay per acre, when used in a different manner. Each manure was found to act better under certain conditions; and though of these conditions only a very few have been ascertained, many others are suggested, and a method of proving some explained.

Another point of evident importance in grass manuring, is the proper *time* of application. The experiments on this question show, that the answer is not alike for all kinds of manures. They also suggest, that, by the autumn application of a purely mineral manure, the need for that costliest of all manures—nitrogen—might possibly be dispensed with.

It is somewhat difficult to write of experiments in a manner at once simple and accurate; but perhaps the best is that followed in this chapter, of placing all the details at the end, and of introducing the reader at once to the more important and practical conclusions.

Each manure will be discussed in the order shown in the following list; in which each has a value attached,—not the highest, but generally such only as is warranted by several independent experiments. The hay is valued throughout at 6d. per stone of 14 lbs. :—

Field Value of Twelve Manures for Grass.

TABLE I.—WEIGHT AND VALUE OF HAY PER ACRE PRODUCED BY ONE CWT. OF THE FOLLOWING MANURES.

| No. | Manure | gave 6 cwts. | 78 lbs. of Hay value | £ | s | d |
|-----|----------------------|------------------------|----------------------|---|---|----|
| 1. | Nitrate of Soda | | | 1 | 6 | 9 |
| 2. | Sulphate of Ammonia | 6 | 39 | 1 | 5 | 5 |
| 3. | Peruvian Guano | 5 | 26 | 1 | 0 | 10 |
| 4. | Sulphate of Potash | 2 | 5 | 0 | 8 | 2 |
| 5. | Dissolved Bones | 2 | 0 | 0 | 8 | 0 |
| 6. | Superphosphate | 1 | 110 | 0 | 7 | 11 |
| 7. | Muriate of Potash | 1 | 75 | 0 | 6 | 8 |
| 8. | *Farmyard Manure | 1 | 47 | 0 | 5 | 8 |
| 9. | Bone Dust | 0 | 72 | 0 | 2 | 7 |
| 10. | Sulphate of Magnesia | 0 | 50 | 0 | 1 | 9 |
| 11. | Gypsum | 0 | 24 | 0 | 0 | 10 |
| 12. | Salt | decreased the produce. | | | | |

NITRATE OF SODA, it will be observed, heads this list with a good round sum, and deservedly so; for it was found to be upon the whole the best top-dressing for grass-land, where quantity was chiefly aimed at.

Of the nitrogenous manures it was the most thoroughly tested, being cross-examined in many experiments. Thirteen trials of it are available; but, for convenience, we will first analyse five of these, in which the nitrate of soda was applied alone: these are arranged in the table below, the increase of weight only being given; but the full details can be found at the end of this chapter; by a reference to the figures in the last column, which are those of the two plots, and the series which furnish the data, &c.

TABLE II.—INCREASE BY NITRATE OF SODA,
WHEN USED ALONE.

| 4 cwts. per acre produced per cwt | 54½ stones of hay. | See | A 11-7 |
|-----------------------------------|--------------------|-----|---------|
| 4 " " | 50½ | " | D 2-4 |
| 4 " " | 55½ | " | F 2-4 |
| 3 " " | 38½ | " | H 12-13 |
| 2 " " | 39 | " | I 2-3 |
| Average of the five | 47½ | " | |

The last experiment, Series I, was tried on a poor clay, where sulphate of ammonia proved much better than the nitrate; and the one before it, Series H, is calculated from

* For Farmyard Manure the produce is calculated per ton.

The Heaviest Dressing of Nitrate of Soda the most Profitable.

the first cutting only; the second cutting reducing the increase of hay to 13 stones over that of the no-manure plot.

Four cwts. per acre, it will be observed, did very much better than a less quantity. Farmers, as a rule, err in this respect; applying too little manure, and reaping a correspondingly small return.

The four cwts. of manure gave, over three different seasons, an average increase of $53\frac{1}{2}$ stones of hay for every cwt. of nitrate of soda so applied; while the less quantities gave only $38\frac{3}{4}$ stones. So that, *when nitrate of soda was applied in a less quantity than four cwts. per acre, the returns fell off about 7s. on every cwt. so applied.*

The quality was, of course, inferior with the larger quantity; but to determine the quality of the produce, would require both feeding experiments, and analytical comparisons.

Nitrate of soda used with phosphate, &c., was the subject of the other eight experiments yet to be discussed. Three of these will be considered first, in which 4 cwts. per acre were used with an equal quantity of superphosphate.

TABLE III.—INCREASE BY NITRATE OF SODA WITH SUPERPHOSPHATE, BOTH BEING AT THE RATE OF 4 CWTs. PER ACRE.

| | | | | | |
|----------------------------|-----------------|----------------|-----|---|------|
| In 1868 each cwt. produced | $40\frac{1}{2}$ | stones of hay. | See | A | 3-9 |
| „ 1869 „ „ | $8\frac{1}{2}$ | „ „ | „ | D | 11-5 |
| „ 1870 „ „ | $52\frac{1}{2}$ | „ „ | „ | F | 11-5 |
| Average of three years „ | $33\frac{3}{4}$ | „ „ | | | |

Here it is at once evident, on comparing the above returns with those of Table II., that 4 cwts. of nitrate of soda was not improved by the addition of 4 cwts. of superphosphate; but that in every case it proved less productive than before. A contrary result was, however, obtained in three out of six similar experiments reported by Dr. Voelcker, which will presently be more fully referred to. But the remaining three show results similar to the above. It is, however, possible that the smaller yield of the nitrate in these three experiments may be due to excessive manuring; let us, therefore, examine the remaining five experiments, in each of which not more than 2 cwts. of the nitrate was used, with from 4 to 5 cwts. of superphosphate, potash, &c.

Nitrate of Soda best Used with Mineral Manures.

TABLE IV.— INCREASE BY NITRATE OF SODA, WITH MINERAL MANURES.

| I | cwt. per acre produced | 30 | stones of Hay. | See B | 8- 2 |
|-------------------------|------------------------|-----------------|----------------|-------|------|
| I | „ „ „ | 75 | „ „ „ | „ E | 7-14 |
| $1\frac{3}{4}$ | „ „ „ per cwt. | $45\frac{3}{4}$ | „ „ „ | „ G | 9- 2 |
| $1\frac{3}{4}$ | „ „ „ „ | $42\frac{3}{4}$ | „ „ „ | „ H | 2- 7 |
| 2 | „ „ „ „ | $67\frac{1}{4}$ | „ „ „ | „ I | 7- 8 |
| Average of the five „ „ | | 52 | „ „ | | |

At once we see, that though 4 cwts. of nitrate of soda did better than a less quantity when it was used alone, it was far too much when other manures were used with it. We see also that the highest return per cwt. was obtained by using it at the rate of 1 or 2 cwts. per acre in conjunction with mineral manures; 75 stones and $67\frac{1}{4}$ being thus obtained, whereas $55\frac{1}{2}$ stones was the highest weight obtained when it was used alone. The averages from Tables II. and IV. are also practically the same, warranting the conclusion that, as a rule, *nitrate of soda is most profitably used in conjunction with mineral manures.*

The mineral manures used in these experiments contained superphosphate, potash, soda, and magnesia (for the details, see the end of the chapter); and as some one of these may have been unfavourable to the full action of nitrate of soda, it is much to be desired, that it should be again and repeatedly tested with, at least, the first three of these. How this testing should be conducted on an exhaustive system of cross experiments, will be presently described when our cross tests, with superphosphate, muriate of potash, &c., are described.

The nitrate of soda used in these experiments was of the best commercial samples, containing about 5 per cent. of impurities. It is estimated as containing in each cwt., 18 lbs. of nitrogen, equal to a percentage of 16·07.

No. 2, SULPHATE OF AMMONIA, though second on the list, is but very little behind nitrate of soda; to which, indeed, it is superior in some respects. What these are will be seen presently, when we analyse the eleven available trials, in which the two were tested under exactly similar conditions. As before, we will first consider its effects when used alone.

Sulphate of Ammonia Used alone and in Mixture.

TABLE V.—INCREASE BY SULPHATE OF AMMONIA USED ALONE.

| | | | | | |
|----------------------------|-------------------|----------|---------------------------------|-------|------------|
| 4 cwt. | per acre produced | per cwt. | 64 $\frac{1}{2}$ stones of hay. | See A | 10- 7 & 18 |
| 4 | " | " | 46 $\frac{1}{2}$ | " | D 3- 4 |
| 4 | " | " | 35 $\frac{3}{4}$ | " | F 3- 4 |
| 3 | " | " | 34 $\frac{1}{4}$ | " | H 11-13 |
| 2 | " | " | 65 $\frac{3}{4}$ | " | I 1- 3 |
| Average of the first four, | | | 45 $\frac{1}{4}$ | " | |

That the sulphate is not so reliable, or constant in its effects as nitrate of soda, will be seen by a comparison of Tables II. and V. At the same time, under favourable conditions, it produces much the heavier crop. It is analytically a stronger manure, containing the larger proportion of nitrogen.

The last trial was on clay land, and shows the very high value for the sulphate of 33s. per cwt.; but as only one trial was made on this soil, it can only be regarded as probable that, for clay soils, sulphate of ammonia is superior to nitrate of soda.

Mineral manures applied with sulphate of ammonia formed the subject of the six experiments given below, all except the last being tried, as usual, on light land.

TABLE VI.—INCREASE BY SULPHATE OF AMMONIA WHEN USED WITH MINERAL MANURES ON GRASS LAND.

| | | | | |
|--|-------------------|---------------------------------|------------------|---------|
| 1 cwt. | per acre produced | 45 $\frac{3}{4}$ stones of hay. | See B | 7- 2 |
| 1 | " | 38 $\frac{1}{2}$ | " | B 5- 4 |
| 1 | " | 43 | " | E 5-14 |
| 1 $\frac{3}{4}$ cwt. | " | 28 $\frac{1}{4}$ | " | G 10- 2 |
| 1 $\frac{3}{4}$ | " | 41 $\frac{1}{2}$ | " | H 4- 7 |
| 2 | " | 95 | " | I 5- 8 |
| Average of the five light land trials, | | | 39 $\frac{1}{2}$ | " |

Mineral manures did not here correspondingly increase the value of sulphate of ammonia, except in the case of the trial on clay soil, Series I, where the improvement is very marked, amounting to nearly 14s. 6d. per acre, and giving the high value per cwt. of £2 7s. 6d. A reference to the details of Series I, at the end of the chapter, will show how poor this soil was; the two plots unmanured growing only about half a ton of hay per acre. From this it seems probable that, *except upon poor land, sulphate of ammonia acts better when used alone.*

Peruvian Guano gives the Best Return when Used by Itself.

This conclusion may possibly need some qualification; for time of application, and wetness of season, have much to do with the action of sulphate of ammonia; and in the last year of our farming we had in progress a series (K) of 22 plots to test this point. These will be considered in their proper place; but meantime it is well to remember;—that sulphate of ammonia proved inferior to the minerals in October, almost equal in January, and superior in May.

NO. 3. PERUVIAN GUANO.—As showing the value of guantic nitrogen, the following results are of value; otherwise it were almost unnecessary to say much about Peruvian guano, the original Chinchá Island supplies having failed, and the reliable kind not being now to be had. Eight experiments on this manure are available; and in the three given below it was applied alone, and at the rate of 4 cwts. per acre.

TABLE VII.—INCREASE BY FOUR CWTs. OF PERUVIAN GUANO USED ALONE.

| | | | |
|----------------------------|----------------------|-------|------|
| Each cwt. produced of Hay, | 51½ stones per acre. | See A | 12.7 |
| “ “ “ | 42 “ | “ D | 1.4 |
| “ “ “ | 31½ “ | “ E | 1.4 |
| Average of the three, “ | 41½ “ | | |

It is thus seen to be inferior to either of the two other nitrogenous manures, when used alone, at the rate of 4 cwts. per acre. Applied thus, the relative values of the three were, for light land—

| | |
|-------------------------------|-----------------------------|
| Nitrate of Soda gave per cwt. | 53½ stones of hay per acre. |
| Sulphate of Ammonia “ | 49 “ “ |
| Peruvian Guano “ | 41½ “ “ |

The addition of minerals (bone dust on B 13-12) to Peruvian guano was tried on five plots, the results per acre were as below.

TABLE VIII.—INCREASE BY PERUVIAN GUANO USED WITH MINERALS.

| | | | |
|--------------------------------|-------------------|-------|-------|
| 1 cwt. per acre produced | 7½ stones of Hay. | See B | 9.2 |
| 1 “ “ “ | 6½ “ | “ B | 13.12 |
| 1½ cwt. “ “ per cwt. | 36½ “ | “ E | 6.14 |
| 2 “ “ “ “ “ | 12½ “ | “ G | 11.2 |
| 2½ “ “ “ “ “ | 40 “ | “ H | 3.7 |
| Average (excluding B 13-12), ½ | 24 “ | | |

Value of Nitrogen different in Three Nitrogenous Manures.

Except bone dust, no addition was of any advantage; and with bone dust, only this one trial was made. The evidence, therefore, tends to show that *Peruvian guano does best on grass land when used alone*; and also that it is more dependent on season than the other two nitrogenous manures.

Comparing now, the three nitrogenous manures already reviewed, we find that nitrate of soda is the most reliable in all seasons; and as a rule, the best manure of the three. If we assume the whole of the effects to be due to the nitrogen they contain; and reckon the nitrate of soda to contain 18 lbs. per cwt. (equal to 16.07 per cent.), the sulphate of ammonia 22 lbs. per cwt. (equal to 19.64 per cent.), and the guano 14 lbs. per cwt. (equal to 12.50 per cent.), we get the following value for nitrogen in each manure.

TABLE IX.—INCREASE OF HAY PER LB. OF NITROGEN FROM THREE NITROGENOUS MANURES.

| | Used alone. | Used with Minerals. |
|-------------------------|-----------------------|-----------------------|
| Nitrate of Soda, .. | 38 $\frac{3}{4}$ lbs. | 37 $\frac{1}{2}$ lbs. |
| Sulphate of Ammonia, .. | 29 " | 25 " |
| Peruvian Guano, .. | 41 $\frac{1}{2}$ " | 24 " |

Peruvian guano stands highest, but its phosphates, &c., have probably placed it there, as used with minerals it stands lowest. Upon the whole, the nitrogen of nitrate of soda seems by far the most active; a fact worth remembering when a grass manure is purchased by analysis.

NO. 4, SULPHATE OF POTASH.—With this salt, three trials were made at the rate of 4 cwts. per acre; the increase varied from 34 $\frac{1}{2}$ stones to 85 stones of hay per acre, and averaged, per cwt. of sulphate of potash, 16 $\frac{1}{4}$ stones of hay, value about 8s. 2d.

It proved better than an equal dressing of muriate of potash by 9 $\frac{1}{2}$ stones of hay. The numbers of the plots were A 5, D 8, and F 8. In B 3 it was also tried at the rate of 1 cwt. per acre, in conjunction with superphosphate, sulphate of magnesia, and salt; and gave an increase of 8 $\frac{1}{2}$ stones over B 2, a similar plot with 1 cwt. of muriate of potash. It was a little unfortunate that no good chance of weighing the fog occurred; for, on the only occasion (Series

Dissolved Bones—value for Hay.

D) when this was attempted, the heaviest weight was from the sulphate of potash plot.

Kainit contains its potash in the form of sulphate; but as will presently be seen, has other drawbacks which more than counterbalance this. (See also Kainit in the Index.)

No. 5, DISSOLVED BONES.—The experiments with this manure on grass are few in number, and difficult of exact comparison. The only one in which it was applied alone was B 11, in which 5 cwts. per acre gave an increase of exactly 10 cwts. of hay, equal to 16 stones from each cwt. of manure; thus placing its value at 8s. From one experiment, however, no safe conclusion can be drawn. In the other two it was used with Peruvian guano, which prevents our directly estimating its value; but indirectly we can do so, by comparing each of the three with a similar plot, in which mineral manures were substituted for the bones. (See notes to E and G near the end of the chapter.

TABLE X.—DISSOLVED BONES *versus* MINERAL MANURES ON GRASS.

| Manures per Acre. | Dissolved Bones. | | | Minerals. | | | Difference | Plots. |
|--|------------------|------|------|-----------|------|------|------------|---------|
| | T. | Cts. | Lbs. | T. | Cts. | Lbs. | | |
| 5 cwts. used alone, | 2 | 5 | 80 | 2 | 10 | 20 | 4 52 | B 11- 2 |
| 3 $\frac{3}{4}$ „ and Per. Guano 1 $\frac{1}{4}$ cwts. | 3 | 0 | 63 | 2 | 18 | 89 | 1 86 | E 8- 6 |
| 5 „ „ 2 „ | 1 | 12 | 6 | 1 | 15 | 6 | 3 0 | G 11-12 |
| Difference against Dissolved bones, | | | | | | | 5 78 | |

This shows dissolved bones inferior to the mixed minerals by 5 cwts. 8 lbs. of hay on the three experiments, equal to 46 lbs. of hay per cwt. of manure. And therefore, though valued in the list at 8s. per cwt., the probabilities are that its real value is less.

As to the lasting qualities of dissolved bones, Series D experiments on potatoes supplies some facts.

The above experiments, confirmed also on potatoes and turnips, went far to induce us to give up the use of bones on the farm; and looking at all the experiments, the evidence tends to show, *that, being a favourite manure, bones command*

How to find the real Field Value of a Manure.

a higher price in the market than is warranted by their real manurial value.

Another lesson to be learned from the above is, that dissolved bones do better when aided by some nitrogenous manure, such as Peruvian guano, &c.

NO. 6, SUPERPHOSPHATE.—Coprolites, treated with sulphuric acid, so as to test about 28 per cent. of soluble phosphate, form the subject of fifteen experiments available for comparison; but it was employed in fully one-half of all our experiments tried on grass land.

When the problem of how to make a good grass manure for our farm first presented itself, ammonia, phosphates, potash, magnesia, and soda, naturally suggested themselves as necessary. But the practical question was, what are the respective values of these? Applying each separately would not tell, for *a deficiency of one necessary element* would prevent the full action of the others, just as the best managed crop cannot grow without a sufficiency of rain. Nor would using them together tell, for how could it then be known how much of the increase was due to each?

At last, after many plans, what we called the "Test plot" system was contrived; in which four simple manures were tried, each with, and without, any and all of its neighbours. Now, as three manures on this plan required 8 plots, and 4 required 16, and 5, 32; it was evident that only the likely manures were worth the trouble involved. So superphosphate, potash, magnesia, and salt, were chosen; as being both readily obtained, and likely to be useful.

To test these four manures, sixteen plots were required, eight with each manure, and eight without. It will readily be seen that superphosphate would thus be applied four times with muriate of potash, and four times without it; and so on with the other two manures. By this means the effect of each manure alone, as well as on its neighbours, was fully tested; or, as a friend remarked, it was "ringing the changes," on the four manures.

This system was tried on hay, potatoes, and oats; but variation of the soil, that bane of field experimenters, inter-

Superphosphate examined by the Test Plot System.

ferred in two of the trials; and those on hay alone were of value.

The results of these cross tests, when examined, give rise to more questions by far than they answer, and open up a wide field of inquiry. The effects of some of the manures on its companions were of so striking a nature that, in the absence of confirmatory proof, they should be accepted, not as conclusive, but suggestive only.

A study of the plan of these cross tests will show that, if repeated often enough to present reliable averages, the results would warrant a much closer analysis than has been attempted.

There is one drawback under which this series labours, namely, that a cwt. of sulphate of ammonia, applied about five weeks after the other manures, was unfortunately not applied to the unmanured plot. This was a mistake, as it excludes this plot from use entirely; and limits the averages generally to six plots, whereas eight should have been available for each manure.

The details of these experiments are all included in Series C.

Beginning, then, with superphosphate, let us take the average of the seven comparable plots, and deduct from this the average yield of the analogous seven not-superphosphate plots, thus—

| | | |
|---|----------|---------|
| Average of seven plots, with 5 cwts. of superphosphate, | 44 cwts. | 49 lbs. |
| “ “ without superphosphate, | 35 “ | 86 “ |
| Increase from 5 cwts. of superphosphate, | 8 “ | 75 “ |

Giving 1 cwt. 82 lbs. of hay per cwt. of superphosphate. But this is its action in the presence of a general medley of other manures, some of which may have been favourable and others unfavourable to the crop; and the effects of each one of which we must now find and eliminate.

To begin with muriate of potash, which was present in an equal number of plots on each side of the above equation; let us take first the three superphosphate plots, dressed also with potash, and then from these let us subtract the three potash plots, similarly manured in every respect, except that superphosphate was absent;—thus

Superphosphate one-third more effective in the presence of Potash.

| | |
|--------------------------------------|--------------------------|
| Superphosphate and Potash | averaged 45 cwt. 81 lbs. |
| Potash without Superphosphate | „ 35 „ 93 „ |
| Produce of 5 cwt. of Superphosphate, | 9 „ 100 „ |

Giving 1 cwt. 110 lbs. of hay per cwt. of superphosphate, in the presence of muriate of potash.

Now, if we can get at its action in the *absence* of muriate of potash, we can soon tell whether the latter was a help or a hindrance to superphosphate. This can be done by pursuing the same course, but using this time the superphosphate, and not-superphosphate plots, which received no muriate of potash. Their averages were as follows—

| | |
|---------------------------------------|-------------------------|
| Superphosphate <i>without</i> potash, | averaged 42 cwt. 0 lbs. |
| Three analogous plots, wanting both, | „ 34 „ 68 „ |
| Produce of 5 cwt. of Superphosphate, | 7 „ 44 „ |

Giving 1 cwt. 53 lbs. of hay per cwt. of superphosphate, when muriate of potash was absent.

But it has been seen that, in the presence of potash, it gave 1 cwt. 110 lbs.; being 57 lbs, or nearly by one-third greater increase than in its absence. The muriate of potash had of course besides this, an independent value of its own, as will presently be seen; but the fact to be clearly understood just now is, *that the presence of potash made superphosphate one-third more effective.*

A similar result is obtained from A 2-6-9, D 5-7-12, and F 5-7-12, in which 4 cwt. of superphosphate were applied, both with and without muriate of potash. The increase, however, is smaller, being only about one-tenth; but Series C had the aid of 1 cwt. per acre of sulphate of ammonia, in the presence of which, mineral manures are almost always more active.

But the strongest proof of this interaction of these manures is to be obtained from the results of six experiments tried in different parts of England, and reported by Dr. Voelcker in the Journals of the Royal Agricultural Society of England for 1866 and 1869. These were the same in arrangement as Series A, D, and F, all three of which were tried for Dr. Voelcker, having been arranged by him for trial throughout the country. These six show the produce per cwt. of superphosphate at 1 cwt. 69 lbs. of hay per acre, in the absence

Superphosphate as affected by Magnesia and Salt.

of muriate of potash; but 3 cwts. 7 lbs. in its presence;—results far outstripping those obtained at Blennerhasset, *showing indeed an increase of nearly double*, the exact amount being 89·5 per cent.

Returning now to the test plot, Series C, and pursuing with the sulphate of magnesia plots, the course adopted with muriate of potash, we find that *magnesia decreased the effect of superphosphate by about 4 per cent.*; an increase of 208 lbs. of hay per cwt. being reduced 8 lbs. by the presence of magnesia.

The salt plots cross-examined in the same manner show this manure favourable to the action of superphosphate, but only slightly so, increasing its effect 9 lbs. on 184, or about 5 per cent.

These are important facts; but similar experiments should be repeated with varied quantities of these manures. That on the whole, the quantities used in Series C were not excessive, is shown by the fact that plot 11, dressed with all four, gave a very good crop, standing third of the sixteen.

Nitrogenous manures also greatly affected the value of superphosphate; but though we have great numbers of experiments with both manures, it is difficult to separate the action of each; for in most cases, less nitrogenous manure per acre was used with the superphosphate than without it; and as has been seen, quantity is an important disturbing element in all experiments, and where the quantity has been varied, reliable conclusions can rarely be drawn.

In three trials—A 2-9, D 12-5, and F 12-5;—4 cwts. of nitrate of soda were added to 4 cwts. of superphosphate; and in each case the result was a decrease as compared with the effect of nitrate of soda alone; a decrease due, as has been shown on page 332 to the quantities used. But even this does not hold good for every part of the country; three of Dr. Voelcker's six experiments before referred to showing a decrease, and other three an increase.

The test plots, Series C, also furnish evidence on this point, the seven superphosphate plots giving an average

Superphosphate doubled in value by Sulphate of Ammonia.

return per cwt. (in the presence of sulphate of ammonia) of 194 lbs. of hay, value 6s. 11d. There is also the experiment on poor clay, Series I, 4-1, in which 4 cwts. of superphosphate gave (in the presence of sulphate of ammonia) 4 cwts. 72 lbs. increase of hay per acre. Difference of soil, however, excludes this latter experiment.

The value given for superphosphate by Series C, was much higher than that obtained by using it without nitrogenous manures; and though the evidence is thus indirect, it is to the effect *that superphosphate should have the aid of a nitrogenous manure*. This conclusion must, however, be modified by circumstances, as was explained when sulphate of ammonia (No. 2) was under discussion.

Collecting now the facts just shown, and reducing them to the uniform basis of 1 cwt. of manure per acre, they compare as follows:—

TABLE XI.—VALUE OF SUPERPHOSPHATE PER CWT. FOR HAY, WHEN USED IN THREE DIFFERENT WAYS.

| Manner of Using the Superphosphate. | Lbs. Increase of Hay per cwt. of Superphosphate. | | | | Value of the Hay. | | |
|---------------------------------------|--|-----|----|----------|-------------------|----|----|
| | A. | D. | F. | Average. | £ | s. | d. |
| Used alone, | 108 | 114 | 16 | 79 | 0 | 2 | 10 |
| Used with Muriate of Potash, | 210 | *43 | 91 | 86 | 0 | 3 | 1 |
| Used with Sulphate of Ammonia, &c., . | .. | .. | .. | 194 | 0 | 6 | 11 |

* This sum represents a decrease.

The last value, 6s. 11d. per cwt., representing as it does the average of seven experiments from Series C, is very satisfactory, and shows a great advantage from the aid of sulphate of ammonia. The absence of that manure reduces the value of superphosphate to 3s. 1d. per cwt., if with muriate of potash; and to 2s. 10d. per cwt., if used alone.

As has been noticed, Dr. Voelcker's experiments give results much higher, the averages of his six showing from superphosphate applied alone, 181 lbs. of hay, value 6s. 6d. With muriate of potash, the superphosphate gave 343 lbs. of hay, value 12s. 3d.; and with nitrate of soda, 257 lbs. of hay, value 9s. 2d. Probably the Blennerhasset results are lower,

Effects of four different Manures on the action of Superphosphate.

on account of the farm having been generally so well manured with bones. This would render phosphates of less value to the soil.

Below is given a brief tabular summary of the foregoing facts, which will simplify comparison.

TABLE XII.—EFFECTS OF THE PRESENCE OF SOME MANURES ON THE ACTION OF SUPERPHOSPHATE.

| | | | |
|---|---|---|------|
| Sulphate of Ammonia increased its effect by 126 per cent. | | | |
| Muriate of Potash | „ | „ | 34 „ |
| Common Salt | „ | „ | 5 „ |
| Sulphate of Magnesia decreased | „ | „ | 4 „ |

These facts, if confirmed by further experiments, would be of great practical value. But on a few experiments we must not build too much. As they stand, the facts tend to show that, *on light land, superphosphate should be aided by nitrogenous manures, and generally, too, by potash.*

NO. 7, MURIATE OF POTASH, formed the subject of many experiments, and was also one of the manures selected for the test-plot experiments. With salt, its behaviour was especially striking; and also, as has been seen, with superphosphate. The strength of this manure was generally 82 per cent., but it varied from 80 to 83.

Beginning with the test-plot Series C, we find its average increase was 3 cwts. 5 lbs. of hay per acre, which, as 4 cwts. of potash were used, equals 85 lbs. of hay per cwt. of manure. But the main value of this series lies in the separation of the effects of each manure. The first question is, therefore, Does superphosphate help or hinder the action of potash?

Pursuing a course similar to that used for determining the effect of muriate of potash on superphosphate, we find that the averages of the three superphosphate plots with, and the three without potash, to stand as follows:—

| | |
|---|------------------|
| Muriate of Potash, with Superphosphate, &c., averaged | 45 cwts. 81 lbs. |
| Superphosphate, &c., without Muriate of Potash, „ | 42 „ 0 „ |
| Produce of 4 cwts. of Muriate of Potash, | 3 „ 81 „ |

Giving 104 lbs. of hay per cwt. of muriate of potash, in the presence of superphosphate.

Muriate of Potash Threefold more effective if used with Superphosphate.

Taking next the three potash plots and the three not-potash plots, receiving no superphosphate, we find their averages as follows:—

| | | | | |
|---|----|-------|----|------|
| Muriate of Potash, without Superphosphate, averaged | 35 | cwts. | 93 | lbs. |
| Three analogous plots wanting both | 34 | „ | 68 | „ |
| Produce of 4 cwts. of Muriate of Potash, | 1 | „ | 25 | „ |

Giving 34 lbs. of hay per cwt. of muriate of potash, in the absence of superphosphate.

This shows that the presence of superphosphate increased the action of muriate of potash three-fold; the figures being 70 lbs. on 34, or 205·8 per cent.

Results at first sight contradictory to the above, are furnished by the three experiments given below. These differed from Series C in the absence of any nitrogenous manure.

TABLE XIII.—PRODUCE PER CWT. OF MURIATE OF POTASH WITH AND WITHOUT SUPERPHOSPHATE, BOTH BEING AT THE RATE OF 4 CWTs. PER ACRE.

| | With. | Without. | |
|---|----------|----------|----------|
| Each cwt. gave increase of hay per acre | 195 lbs. | 116 lbs. | A 2-6-9 |
| „ „ „ „ | 38 „ | 198 „ | D 5-7-12 |
| „ „ „ „ | 70 „ | 13 „ | F 5-7-12 |
| Average of the three, | 101 „ | 109 „ | |

The averages show a better result in the absence of superphosphate, but examination shows this entirely due to the experiment of Series D; and excluding this, the averages of the others were 65 and 133 lbs.; showing the effect of muriate of potash more than doubled by the presence of superphosphate.

Dr. Voelcker's six experiments, before referred to, confirm this; muriate of potash averaging per cwt., per acre, only 108 lbs of hay, when used alone; but 465 lbs. in the presence of superphosphate; *an increase more than three-fold*. Of these results, that from muriate of potash used alone is almost identical with the Blennerhasset average; but the others are much higher, probably for the reason before mentioned in connection with superphosphate. This, of course, includes also the increase due to the effect of muriate of potash on the superphosphate: but the number of experiments is much too limited for a satisfactory separation of these.

Salt injurious to the action of Muriate of Potash.

Returning again to the test-plots, and cross-examining the sulphate of magnesia plots, we find this manure a help to muriate of potash; an average increase of 167 lbs. of hay (in its absence) being raised to 517 by its presence; an increase of 209 per cent. *Magnesia, therefore, increased the effect of muriate of potash three-fold.*

Salt, on the other hand, was found by a similar examination to decrease the effect of potash; the 4 cwts. muriate of potash giving an increase per acre of 610 lbs. of hay in the absence of salt, but only 200 lbs. in its presence; showing a decrease of 67·1 per cent. *Salt, therefore, decreased the effect of muriate of potash about two-thirds.*

I am not aware of any similar experiments having been tried on the interaction of magnesia and salt with potash manures; Messrs. Lawes and Gilbert's experiments show rather their joint effects, and confirmatory proof is therefore wanting. Some other Blennerhasset experiments (see Series F in Experiments upon Potatoes), however, partly confirm them.

It would be of great service to agriculture, to have this subject well investigated.

The above results show, of course, only the effects of *sulphate* of magnesia and *chloride* of sodium on *chloride* of potassium; and it is not improbable that *other* salts of these bases might act differently. As it is, the little evidence available tends to show that the potash in Kainit and other low-class potash salts, is placed at a great disadvantage, by the compulsory presence of so much salt.

The presence of nitrogenous manures was also found greatly to affect the action of muriate of potash. The test-plot Series C furnishes good evidence on this point, if we use only the not-salt plots. Series H, Nos. 4 and 8, give also good evidence; and Nos. 5 and 4 of Series I, the Gowrie clay experiment; but the nature and poverty of this latter soil interfered. Below, however, these three experiments are compared with the results from A, D, and F, in which latter superphosphate was used without nitrogenous manures. To facilitate comparison, all the weights have been divided by the cwts. of manure applied.

Muriate of Potash as affected by various Manures.

TABLE XIV.—PRODUCE PER CWT. OF MURIATE OF POTASH USED WITH AND WITHOUT SULPHATE OF AMMONIA.

| | With. | Without. |
|---|-------|----------|
| Each cwt. gave increase of hay per acre | 152 | 195 |
| “ “ “ “ | 263 | 38 |
| “ “ “ “ | 145 | 70 |
| Average of the three, | 187 | 101 |
| Giving the potash a value per cwt of | 6/8 | 3/7 |

This shows that the presence of sulphate of ammonia nearly doubled the effect of muriate of potash;—each cwt. then giving 3s. 1d. more value in hay, or an increase of 86 per cent. Indirectly this result is confirmed by Messrs. Lawes and Gilberts' experiments, which show the power of these mineral manures as always improved by the presence of ammonia salts.

This ends the examination of the potash experiments on hay; and before concluding, it may be well to place side by side the various facts which the soil has given in answer to our chemical questions.

TABLE XV.—EFFECTS OF THE PRESENCE OF VARIOUS MANURES ON THE ACTION OF MURIATE OF POTASH.

| | |
|--|--------------|
| Sulphate of Ammonia increased its power by | 86 per cent. |
| Superphosphate “ “ | 205 “ |
| Sulphate of Magnesia “ “ | 209 “ |
| Salt decreased “ | 67 “ |

When it is remembered that each of these manures has also an independent effect of its own, which is all but eliminated from the above; and that this table simply expresses the increased power of the potash manure in their presence, the above facts must be recognised as furnishing most important and practical lessons. They also raise the question, what of the effects of other manures on these? and open up a wide field of inquiry:—a field in which there is room and honour for many workers: for Mother Earth never fails to answer the questions of the patient and unprejudiced experimenter.

Muriate of potash was not, in any of the Blennerhasset grass experiments, a profitable manure. The best result obtained was 8s. 10d. per cwt.; which sum might have been

Farmyard Manure—its value for Hay.

raised to the paying point (about 11s.), had the fog been always weighed, and the after-effects on *quality* valued.

Dr. Voelcker's experiments, however, hold out much better encouragement, showing returns of hay, value 16s. and 20s. from each cwt. of muriate of potash. Used with superphosphate, only one decrease occurred from its use; but the variations were so great, that every farmer should test for himself its value on his own land. Let him try 1½ cwts. of muriate of potash, 3½ cwts. of superphosphate, and 1 cwt. of sulphate of ammonia, against the two latter *without the potash*; and if he cannot make it pay in such good company, he need hardly try it in any other way.

The usual market value of good muriate of potash, testing 80 per cent. is about 10s. per cwt. In 1867 we purchased it at less than 8s., and in 1871 at nearly 14s. When of good quality it should be worth fully four times as much as a good Kainit testing 13 per cent. of potash. This for intrinsic value; but the action of salt on muriate of potash suggests that this latter is really worth comparatively much more. Some useful facts on this point are brought out in the chapter on "Experiments upon Potatoes."

NO. 8, FARMYARD MANURE, proved eighth in value, as far as the spring crop of hay was concerned; but when in Series E a slight fog was cut, it proved heavier than any of the other manures of the series. The fog, however, though valued in that year's results, was unable to balance the deficiency of the spring crop.

This manure was generally applied earlier than the chemical manures. In Series E it was applied in February, and in Series G in December.

TABLE XVI.—FARMYARD MANURE ON GRASS.

| Manure per Acre. | | | Per ton of Manure. | |
|------------------|----------------------|---|--------------------|-------------|
| 9¼ tons | gave increase of Hay | | 15½ stones. | See B 1-6-0 |
| 14 " | " | " | 7¼ " | " E 1-4 |
| 14 " | " | " | 11½ " | " G 3-1 |
| Average, | " | " | 11½ " | |

This shows the value as low as 5s. 5d. per ton. No attempt has been made to estimate the after-value of any of

The Field-experiments with Bone Dust.

the manures, nor could a second grass crop be cut, as the farm grass, after one year's hay, was always broken up for oats or potatoes. The lasting qualities of farmyard manure have already been considered in a previous chapter. (See Farmyard Manure in the Index.)

No. 9, BONE DUST, is placed very low indeed, and undeservedly so; but in the absence of a second year's crop, there was no help for it. Like the dissolved bones, it had only three trials: in the one it was tried by itself, and in the other two with Peruvian guano. Used by itself in B 12-6, 5 cwts. increased the yield of hay only 3 cwts. 24 lbs. per acre, or each cwt. gave 72 lbs. of hay, value 2s. 7d. With Peruvian guano it did better, but how much, can only be indirectly judged, as there were no equivalent only-guano plots to serve as subtractors. Comparing it, however, with equal dressings of mineral manures, it stands as follows:—

TABLE XVII.—BONE DUST *versus* MINERAL MANURES—
YIELD OF HAY PER ACRE.

| Manures per Acre. | Bone Dust. | | | Minerals. | | | Difference | | Plots. |
|--------------------------------------|------------|-------|------|-----------|-------|------|------------|------|--------|
| | T. | Cwts. | Lbs. | T. | Cwts. | Lbs. | Cwts. | Lbs. | |
| 5 cwts. used alone, .. | 1 | 18 | 104 | 2 | 10 | 20 | 11 | 28 | B 12-2 |
| 4 " and Per. Guano 1 cwt., | 2 | 6 | 108 | 2 | 11 | 8 | 4 | 12 | B 13-9 |
| 3½ " " 1½ " | 3 | 3 | 87 | 2 | 18 | 89 | 4 | 110 | E 9-6 |
| Bone Dust inferior to Minerals by .. | | | | | | | 10 | 42 | |

The bone dust in the first two experiments is inferior by 7 cwts. 76 lbs. per acre, but in the last experiment it proves superior by 4 cwts. 110 lbs.; results rather perplexing.

As regards the lasting qualities of bone dust with guano, some facts are given by the potato experiments, Series D, plots 7, 5, and 8, which were continued on the same land for three years. In these potato experiments, though bone dust was superior to dissolved bones, it was beaten every year by the mineral manures and guano of plot 5, which yielded about 24 cwts. better. The dust used, however, was from the hardest of bones, and much of the last season's dressing would still be inactive.

Nothing very definite can therefore be said as to the value of this manure; but I think that except on clay soils,

Magnesia condemned as injurious to the action of Superphosphate.

it is not a useful hay manure. For permanent pasture it has long been a favourite; and its comparative value for that purpose is at present a subject of investigation by the Royal Agricultural Society of England.

NO. 10, SULPHATE OF MAGNESIA, is in the list credited with a value of 1s. 9d. per cwt., an average derived from the seven plots dressed with it in Series C. Another experiment from E, Nos. 13-12 and 14, shows from just half-a-cwt. the large increase of 181 lbs. of hay per acre; but other considerations suggest the soil as the main cause. Another experiment on a poor clay soil (Series I, Nos. 6-4) shows a considerable decrease from 2 cwts., the magnesia plot giving 150 lbs. less hay per acre.

Its price being about 6s. per cwt., it is not a profitable manure; and must be valued more for its action on those manures undoubtedly profitable, and in whose company it will always be applied. Of these, superphosphate is the most important, and the averages of its test plots (Series C) were as follows:—

| | |
|---|------------------|
| Sulphate of Magnesia with Superphosphate averaged | 45 cwts. 43 lbs. |
| Superphosphate without Magnesia | „ 44 „ 56 „ |
| Produce of 2 cwts. Sulphate of Magnesia | „ .. 99 „ |

This is in the presence of superphosphate. In its absence the results were as below—

| | |
|--|------------------|
| Sulphate of Magnesia without Superphosphate averaged | 36 cwts. 50 lbs. |
| Three analogous plots wanting both | „ 35 „ 25 „ |
| Produce of 2 cwts. Sulphate of Magnesia, | „ 1 „ 25 „ |

In the absence of superphosphate it produced 137 lbs., or 38 lbs. more than in its presence. Superphosphate is therefore plainly injurious to its full action; and, as the former manure is of itself profitable, this condemns sulphate of magnesia.

Following out the same course of analysis, we find it affected by other manures as follows:—

TABLE XVIII.—INCREASE OF HAY PER ACRE PER ONE CWT. OF SULPHATE OF MAGNESIA, AS AFFECTED BY SOME MANURES.

| | | | |
|--|---|---------|---------------|
| In the presence of Superphosphate, 50 lbs.; in its absence 68 lbs. | | | |
| „ | „ | Potash, | 152 „ „ *22 „ |
| „ | „ | Salt, | 97 „ „ *6 „ |

* Before a sum means a decrease of weight.

Gypsum worth Two Shillings per Cwt. for Grass.

Superphosphate decreases its yield, while muriate of potash and salt (muriate of soda) very considerably increase it.

These interesting facts suggest that the action of sulphate of magnesia was due more to the sulphuric acid it contains than to the magnesia; for with superphosphate, which contains much sulphuric acid, it is useless, or worse than useless; whereas with the two muriates, or rather chlorides, it gives a very marked increase. At its best, however, it was unprofitable; and its action on superphosphate excludes it from use at any price. The kind used in these experiments was in crystals, and tolerably pure.

NO. 11, GYPSUM.—As Carlisle possessed large gypsum quarries, this manure was readily and cheaply obtained, the price delivered at our station being 15s. a ton. There was therefore every inducement to use it, and experiments as to its usefulness were speedily begun, both on grass and potatoes.

Five experiments are available. In three it was used alone at the rate of 10 cwts. per acre, and in the other two as an addition to other manures, and at the rate of only 4 cwts.

TABLE XIX.—INCREASE OF HAY PER CWT. OF GYPSUM.

| Weight of Gypsum per acre. | | | | |
|----------------------------------|-----------------------|---------|-----------|--|
| 10 cwts. used alone | gave increase of Hay | 22 lbs. | See A 4-7 | |
| 10 | „ „ decrease „ | 41½ „ | „ D 9-10 | |
| 10 | „ „ increase „ | 23½ „ | „ F 9-10 | |
| 4 | with minerals „ „ | 70 „ | „ B 4-2 | |
| 4 | „ „ minerals, &c. „ „ | 45 „ | „ B 5-7 | |
| Average of all five experiments, | | 24 „ | | |

The average yield of hay, if valued at 6d. per 14 lbs., gives a value to each cwt. of gypsum of 10½d. At this price it is hardly profitable, but the experiments approve its use at the less rate per acre; the 10 cwts. averaging only 2 lbs. of hay per acre, but the 4 cwts. 57½ lbs. Used, then, at the rate of 4 cwts., and in conjunction with other manures, it proved worth 2s. per cwt. But to judge reliably of this manure, a second year's cutting should have been obtained.

NO. 12, SALT, is of all the twelve manures the most fickle.

Salt an exceedingly variable, and often injurious Manure for Hay.

Its only constant and reliable action seemed to be that of reducing the yield from muriate of potash. Out of twelve experiments, nine showed a loss, and only three a gain from the use of salt. The details of these were as follows, the weights in the table being those of the hay per acre :—

TABLE XX.—TWELVE EXPERIMENTS WITH SALT FOR HAY.

| Quantity of Salt per Acre. | Decrease. | | Increase. | | Authorities. |
|------------------------------------|-----------|------|-----------|------|---------------|
| | Cwts. | Lbs. | Cwts. | Lbs. | |
| 4 cwts. used alone, .. | 0 | 60 | .. | .. | A 7-8 |
| 4 „ „ „ .. | 3 | 101 | .. | .. | D 4-6 |
| 4 „ „ „ .. | .. | .. | 1 | 23 | F 6-4 |
| $\frac{1}{2}$ „ with Minerals, | .. | .. | 4 | 8 | E 13, & 14-12 |
| $1\frac{1}{2}$ { „ with Minerals } | 3 | 67 | .. | .. | H 4-5 |
| 3 { and nitrogenous } | .. | .. | 2 | 37 | C 14-6 |
| 3 { manurés. } | 15 | 90 | .. | .. | C 6 Plots |
| Totals, | 23 | 94 | 7 | 68 | |

The balance against salt in these experiments was thus more than 16 cwts. of hay. This balance, too, should strictly be still larger, as the heaviest *increase*, that from Series E, is a doubtful one, as the favourable yield of plots 12, 13, and 14, is too much to attribute to the effects of the manures only.

This variable action of salt is, however, no uncommon one; thirteen experiments reported by Dr. Voelcker show so many losses and gains that the average of all gives an increase of only 47 lbs. of hay per acre, from 4 cwts. of salt.

Used with other manures, some of the effects of salt were very curious. The test plots (Series C), compared and averaged, show its action upon the other three manures to have been as follows, the quantity used being 3 cwts. per acre :—

Salt increased the effect of Superphosphate by 5 per cent.
 „ increased „ Sulphate of Magnesia considerably.
 „ decreased „ Muriate of Potash by 67 per cent.

Salt thus proved, on the whole, a slight help to superphosphate for hay, but very injurious to the action of muriate

Value of the early application of Top-dressings.

of potash. These two facts should guide the farmer in the mixing of his grass manures; and on soils where muriate of potash can be profitably used, salt had better be put somewhere else.

This ends the separate consideration of the twelve manures; and the experiments next to be considered refer to the best time of applying them.

TIME OF APPLICATION OF THE MANURES.

The first trials are from Series G, Nos. 4, 5, and 6. The grass manure used was a general one. The 7 cwts. contained of sulphate of ammonia, 116 lbs.; Peruvian guano, 70; superphosphate, 392; and of potash, magnesia, gypsum, &c., 206.

Grass manure applied Feb. 19th, gave of Hay 42 cwts. 22 lbs.

„ „ April 20th, „ 38 „ 67 „

„ „ March 7th, „ 31 „ 50 „

The February application, it will be seen, gave much the best yield, exceeding April by nearly 14s. per acre in its return of hay. But March was inferior to April, a result rather perplexing.

Encouraged by the above result, a series of thirteen experiments were planned for the year following, in which a grass manure was to be sown at six intervals of 14 days each. Two plots were sown at each date, so as to furnish duplicate trials; and in June, 1871, the experiment promised very well. But at mowing time the weather proved so broken that some days elapsed between the cuttings of several of the plots; and the weather was so damp, and the crop so heavy, that the rain clung obstinately to the clover, spoiling the accuracy of the weights. This was the more vexatious, because in the year 1871 the only good second cutting of grass was obtainable. Below are given the four weights of the most reliable cutting, but even this was far from satisfactory. Each plot received 40 lbs. of manure,—a dressing equivalent to 800 lbs. per acre;—consisting of sulphate of ammonia, 113 lbs.; Peruvian guano, 67 lbs.; superphosphate, 462 lbs.; alkaline salts, 115 lbs.; and gypsum, 43 lbs.

Attempt to Dispense with the Nitrogen of a Grass Manure.

TABLE XXI.—HAY PRODUCED BY $7\frac{1}{4}$ CWTs. OF GRASS MANURE SOWN AT INTERVALS OF A FORTNIGHT (SERIES J).

| No. | Date of Sowing. | First Cutting. | | | Second Cutting. | | | Both Cuttings. | | |
|-----|-----------------|----------------|-------|------|-----------------|-------|------|----------------|-------|------|
| | | Tons. | Cwts. | Lbs. | Tons. | Cwts. | Lbs. | Tons. | Cwts. | Lbs. |
| 6. | May 5th. | 2 | 7 | 39 | 1 | 6 | 78 | 3 | 14 | 5 |
| 7. | Feb. 24th. | 2 | 7 | 0 | 1 | 8 | 50 | 3 | 15 | 50 |
| 8. | March 23rd. | 2 | 11 | 0 | 1 | 7 | 67 | 3 | 18 | 67 |
| 9. | April 22nd. | 2 | 17 | 95 | 1 | 9 | 11 | 4 | 6 | 106 |

No satisfactory conclusion can be drawn from the above. For, if we look at the weights of the first cutting, there is practically no difference between those from the earliest and latest topdressings; while both are strikingly inferior to the yield from the topdressings of intermediate dates. Certainly the latest topdressing, that of May, does prove the worst all through; but its teachings are contradicted by those of the next latest topdressing, that of April, which proved the best all through. The weights of the other plots not given in the above only add to the perplexity. But this is far from a solitary instance of how, in experimenting, we frequently found our care and patience at the mercy of the elements; and "Try again" was our only remedy.

The same autumn (1871) saw another series planned and begun, which aimed at more than finding the best time for top-dressing; the main question being no less than the possibility of *dispensing with the costliest element of our grass manures*, by means of an earlier application of the cheaper elements. Good Peruvian guano was now difficult to purchase, and sulphate of ammonia had doubled its price within the last six years. Nitrate of soda, too, was dear; and was besides excluded from mixed grass manures because of its damp-attracting nature. It was therefore of importance to save every pound of nitrogenous manure; and autumn manuring of grass land with mineral manures, suggested itself as the best method, for taking the fullest advantage of the natural nitrogenous compounds which are constantly being formed in all well-ventilated soils. These expectations have been so fully realised that doubtless the season

Plan and Arrangement of Series K.

had much to do with the special results. But this can only be proved by a repetition of the experiments, and we would hardly have published them unconfirmed but that they were tried in the last year of our farming.

Two different mixed manures were employed; the one purely mineral, and the other representing the ordinary grass manures, containing 20 per cent. of a nitrogenous salt. The mineral manure, applied at five intervals of seven weeks each, consisted of superphosphate, 540 lbs.; muriate of potash, 270 lbs.; and gypsum, 90 lbs. per acre. The grass manure, applied at three of these intervals, differed only in the substitution of 180 lbs. of sulphate of ammonia for two-thirds the muriate of potash, reducing the weight of the latter to 90 lbs.

The eight plots thus manured had also duplicates, as we wished to make sure of some results, and to reduce the chances of failure from soil-variations to a minimum. These duplicates were placed at some little distance from each other, and the whole was so arranged that extremes of time and differences of manure were placed side by side. A second duplicate of the first-sown mineral manure was also added; and two other plots were dressed in October with only a half quantity of the mineral manure. The remaining two plots received a mixture of both manures—one plot receiving this dressing in October and the other in May.

Rain fell within a few hours after each dressing—except in December, when three days intervened—and all had thus a good chance. The first dressing only was applied while rain was falling, and the second when a slight frost was on the grass. All the others had mild weather.

The experiments extended into 1872, and after the farm had changed hands; but by the kindness of the steward and the farm bailiff, they were continued, and the grass cut at the usual time. It was weighed immediately, and the weights have been reduced to hay, each cwt. of grass being estimated to make 30 lbs. of hay. This estimate was afterwards found to be rather high; but this circumstance does not affect the comparative value of the results.

Autumn *versus* Spring Topdressing of Grass.

TABLE XXII.—EXPERIMENTS ON GRASS MANURES SOWN AT INTERVALS OF SEVEN WEEKS EACH, BETWEEN OCTOBER 16TH, 1871, AND MAY 2ND, 1872. (SERIES K.)

| No. | Date of Application. | Manure per Acre. | | Weight of Hay per Acre. | | | No. |
|-----|----------------------|------------------|----------------|-------------------------|----|------|-----|
| | | | | T. | C. | lbs. | |
| 1 | May 2nd | Grass | Manure 7 cwts. | 2 | 19 | 0 | 1 |
| 2 | May 2nd | Mineral | „ 7 „ | 2 | 19 | 48 | 2 |
| 3 | October 16th | Mineral | „ 7 „ | 3 | 2 | 96 | 3 |
| 4 | October 16th | Mineral | „ 3½ „ | 2 | 19 | 16 | 4 |
| 5 | October 16th | Grass | „ 7 „ | 2 | 14 | 48 | 5 |
| 6 | October 16th | Mixed | „ 7 „ | 2 | 18 | 88 | 6 |
| 7 | December 8th | Mineral | „ 7 „ | 3 | 7 | 0 | 7 |
| 8 | January 22nd | Mineral | „ 7 „ | 3 | 3 | 80 | 8 |
| 9 | January 22nd | Grass | „ 7 „ | 3 | 0 | 8 | 9 |
| 10 | October 16th | Mineral | „ 7 „ | 3 | 4 | 40 | 10 |
| 11 | March 11th | Mineral | „ 7 „ | 3 | 10 | 96 | 11 |
| 12 | May 2nd | Mineral | „ 7 „ | 3 | 3 | 40 | 12 |
| 13 | May 2nd | Mixed | „ 7 „ | 3 | 3 | 48 | 13 |
| 14 | May 2nd | Grass | „ 7 „ | 2 | 12 | 64 | 14 |
| 15 | October 16th | Grass | „ 7 „ | 2 | 7 | 72 | 15 |
| 16 | January 22nd | Grass | „ 7 „ | 2 | 7 | 0 | 16 |
| 17 | January 22nd | Mineral | „ 7 „ | 2 | 6 | 96 | 17 |
| 18 | October 16th | Mineral | „ 7 „ | 2 | 6 | 0 | 18 |
| 19 | October 16th | Mineral | „ 3½ „ | 2 | 3 | 0 | 19 |
| 20 | December 8th | Mineral | „ 7 „ | 2 | 9 | 40 | 20 |
| 21 | March 11th | Mineral | „ 7 „ | 2 | 8 | 8 | 21 |

The value of the duplicate plots is strikingly illustrated in the above experiment, for at plots 13 and 14 a marked change of soil occurred; but luckily every important plot except one had a duplicate across the line, and the averages of each give practically more reliable results than otherwise.

The best time for application differed for each manure, as will be seen by the comparison of the averages of the duplicate plots given below. To get a comparable average of the mineral manure, sown May 2nd (the plot unfortunate in its duplicate), 7 cwts. and 56 lbs. have been deducted from the average of March 11th, that being the difference between plots 11 and 12, on which these two dates came together. The average weights of hay then stand as follows:—

The Nitrogenous Manure Inferior in Autumn, and Superior in Spring.

| Date of Application. | Mineral Manure. | | | Grass Manure. | | |
|----------------------|-----------------|-------|------|---------------|-------|------|
| | Tons. | Cwts. | Lbs. | Tons. | Cwts. | Lbs. |
| October 16th, | 2 | 14 | 62 | 2 | 11 | 4 |
| December 8th, | 2 | 18 | 20 | | — | |
| January 22nd, | 2 | 15 | 32 | 2 | 13 | 60 |
| March 11th, | 2 | 19 | 52 | | — | |
| May 2nd, | 2 | 11 | 108 | 2 | 15 | 60 |

These averages are very instructive ; and, if similar results could be obtained in every season, a great point would be gained. The best results were from the mineral manure ; and between the December and March applications there was but little to choose ; but December, though slightly less in the averages, seemed the best, as it proved superior to March when tried side by side, as on plots 20 and 21. January was inferior to either, perhaps from the grass being stimulated in the colder weather. October, where close comparison was possible, always proved inferior to every other time (May excepted) ; as a comparison of plots 10 and 11, 17 and 18, and 18 and 20 will show. But May proved still worse, giving about $3\frac{1}{2}$ cwts. less than October on plot 2 as against 3 ; and $7\frac{1}{2}$ cwts. less than March on plot 12 as against 11.

The grass manure, in both its early dressings, was inferior to the mineral, but in May it proved superior. This is, however, proved only indirectly ; the change of soil at plots 13 and 14 preventing direct comparison of the duplicate plots 12 and 14. Plots 1 and 2 show the grass and mineral manures about equal in May ; but the general averages, and all the experiments from Series A to I place the grass manures before purely mineral manures, for spring application. A March dressing with grass manure would have been very useful, but we cannot know beforehand just what may be wanted.

These experiments certainly suggest the possibility of dispensing with the nitrogenous part of the ordinary grass manures. All the previous experiments have shown the effect of the mineral manures as greatly improved by the presence of nitrogenous manures ; but in this series *Time*

Early Sowing of Mineral Manures found best.

has proved still more of an aid. The season was very wet, which probably on our well-drained soil was a great help to the mineral manure; for it is a chemical fact that in the filtration of air through soil (or other porous material), a little ammonia is formed. Hence the passage of much rain into the drains causes an extra aeration of the soil, and thus a greater production of ammonia. The quantity may be trifling, and perhaps not the chief cause of the above good results; but this must be tested by further experiment.

The half-manured plots, Nos. 4 and 19, show very good results, a comparison of plots 2 and 4 *showing 3½ cwt. of manure applied in October to have been practically nearly as good as 7 cwt. applied in May.*

Early sowing of manures is advised by all the experiments. But it would be advisable to avoid sowing late in December or early in January; for, though December did well, it was the earlier part of it; and January is so decidedly inferior to every neighbouring plot that it should be avoided. With less rain in the spring, the top-dressings of mineral manure then, would in all probability have shown less favourably as compared with the autumn dressings. The rainfall of January to the end of June in 1872 was about 50 per cent. beyond the average of the four previous years; that of 1872 being 21·11; 1868, 18·05; 1869, 15·13; 1870, 11·76; and 1871, 12·58 inches. This circumstance was much in favour of the later sown manures; and, indeed, in 1872 a fine crop of hay was obtainable under almost any manurial conditions; the yield of this year exceeding very considerably all our previous experience.

Nitrogenous manuring in the autumn did not do so well, of which the heavy rains were probably the cause; and where the rainfall is heavy, late in February or early in March should be preferred for sulphate of ammonia, and a later date still for nitrate of soda.

This concludes the experiments on grass for hay: and it now remains but to give the details of each of the series referred to in the comparison. But, before doing so, a short description of the methods and precautions adopted in our field experimenting is desirable.

Method of Conducting the Hay Experiments.

Generally each plot was 55 yards long, and about 13 feet wide. The divisions were usually made by the plough, but sometimes only by two or three stakes in harvest; and, as a guide to the mower, a long cord was stretched from pin to pin between the plots, previous to cutting.

The weighing, except of the first few plots of Series A, was all done by means of a good spring balance, which weighed up to 300 lbs. This was attached to one end of a lever, which was in turn suspended from a triangle formed of three wooden legs, each about 12 feet long and 3 inches square. At first the grass was weighed in bundles, by means of a rope; but afterwards a platform was found more convenient. This was made of five or six light wooden spars, about $\frac{1}{4}$ -inch thick, 4 inches deep, and 6 feet long. These were placed on edge, and fastened by cross pieces, so as to leave spaces of about 5 inches between each spar. This formed a light, manageable platform, about 6 feet long, and $2\frac{1}{2}$ feet broad; and, with the addition of a small upright to each corner, it was quite able to hold about 280 lbs. of fresh-cut grass.

Each plot was at first weighed both in grass and in hay; but the ratio was found so variable that, after 1869, generally only the grass was weighed. This was calculated into hay, on the assumption that each 100 lbs. of grass made about 27 lbs. of hay. An average of 22 trials gave 30.5 lbs.; but, as was shown in connection with the lea hay cropping sheets, hay loses from one-tenth to one-seventh in the stack. This gives 26 lbs. or 27 lbs. of hay per 100 lbs. of grass.

The following are the details of the kind and quantities of manure used in the foregoing experiments, and also the weights of hay obtained from each.

DETAILS.

In 1868, Series A, B, and C were tried on the southern slope of the Mid-heads. The soil of this field was a nice gravelly loam, in fair condition. The season was also a good one for hay in Cumberland, but the summer was so excessively dry that in July all the pastures were brown, and a second crop was not obtainable.

Details of the Hay Experiments.

The manures were sown March 18th; and plot 1 A was also re-sown by mistake, when the rest of the field was manured. It was therefore useless as an experiment. Plot 18 A is the same plot as 6 B, and 18 F as 8 G.

HAY.—SERIES A, D, AND F, 1868, 1869, AND 1870.

| No. | No. | Manures in cwts. per Acre. | A. 1868. | D. 1869. | D. Second Cutting. | F. 1870. |
|-----|-----|--|------------|------------|--------------------|------------|
| A. | | | T. C. lbs. | T. C. lbs. | C. lbs. | T. C. lbs. |
| 12 | 1 | Peruvian Guano, 4 cwts., . . . | 2 16 108 | 2 14 13 | 0 90 | 2 4 62 |
| 11 | 2 | Nitrate of Soda, 4, . . . | 2 18 64 | 2 18 70 | 0 63 | 2 16 73 |
| 10 | 3 | Sulphate Ammonia, 4, . . . | 3 5 80 | 2 16 77 | 0 76 | 2 6 84 |
| 7 | 4 | No Manure, . . . | 1 11 28 | 1 11 110 | 1 110 | 1 8 95 |
| 9 | 5 | Superphosphate, 4 cwts., . . . | 1 15 100 | 1 15 88 | 2 28 | 1 9 50 |
| 8 | 6 | Common Salt, 4, . . . | 1 10 80 | 1 7 107 | 2 12 | 1 10 6 |
| 6 | 7 | Muriate of Potash, 4, . . . | 1 15 40 | 1 15 106 | 4 104 | 1 8 84 |
| 5 | 8 | Sulphate of Potash, 4, . . . | 1 18 84 | 2 2 30 | 5 88 | 1 12 67 |
| 4 | 9 | Gypsum, 10, . . . | 1 13 24 | 1 8 8 | 2 58 | 1 9 95 |
| 1 | 10 | No Manure, . . . | .. | 1 11 74 | 2 70 | 1 7 84 |
| 3 | 11 | Superphosphate, 4; Nit. Soda, 4, . . . | 2 16 8 | 1 16 72 | 5 70 | 2 15 73 |
| 2 | 12 | Superphos., 4; Mur. Potash, 4, . . . | 2 2 96 | 1 14 44 | 4 104 | 1 11 106 |
| 18 | 18 | No Manure, . . . | 1 15 80 | .. | .. | 1 7 28 |

HAY.—SERIES B, 1868.

| No. | Manure in cwts. per Acre. | Weight. |
|-----|--|---------------|
| | | T. cwts. lbs. |
| 0. | No Manure (plot 7 A.), . . . | 1 11 28 |
| 1. | Farmyard Manure, 9½ tons, . . . | 2 11 28 |
| 2. | Mineral Manure (4 cwts.), . . . | 2 10 20 |
| 3. | Minerals (Sulphate of Potash), 4 cwts., . . . | 2 11 28 |
| 4. | Minerals, 4 cwts.; Gypsum, 4 cwts., . . . | 2 12 76 |
| 5. | Minerals, 4; Gypsum, 4; Sulph. Ammonia, 1, . . . | 2 17 56 |
| 6. | No Manure, . . . | 1 15 80 |
| 7. | Minerals, 4; Sulphate Ammonia, 1, . . . | 2 15 100 |
| 8. | Minerals, 4; Nitrate Soda, 1, . . . | 2 13 104 |
| 9. | Minerals, 4; Peruvian Guano, 1, . . . | 2 11 8 |
| 10. | Grass Manure, 5 cwts., . . . | 2 12 76 |
| 11. | Dissolved Bones, 5 cwts., . . . | 2 5 80 |
| 12. | Bone Dust, 5 cwts., . . . | 1 18 104 |
| 13. | Bone Dust, 4; Peruvian Guano, 1, . . . | 2 6 108 |

Minerals supplied—Superphosphate, 2 cwts.; Muriate (Sulphate on No. 3) of Potash, 1 cwt.; Sulphate of Magnesia, 45 lbs.; and Salt, 67 lbs.

The grass of A was cut and weighed on June 5th; of B,

Details of the Test-Plot Series C.

June 16th ; and of C, June 17th. The hay of A was weighed July 17th, and of B, July 24th. C was weighed as grass only.

HAY.—SERIES C, 1868.

| No. | Manure in cwts. per Acre. | Weight. | |
|-----|--|----------|-------|
| | | T. cwts. | lbs. |
| 1 | Superphosphate, 5 cwts., | 2 | 1 37 |
| 2 | Superphosphate, 5; Sulphate of Magnesia, 2, | 2 | 1 37 |
| 3 | Super., 5; S. Magnesia, 2; Muriate Potash 4, | 1 | 15 37 |
| 4 | Superphosphate, 5; Muriate of Potash, 4, . | 1 | 9 18 |
| 5 | Muriate of Potash, 4, | 2 | 3 74 |
| 6 | Muriate of Potash, 4; Sulphate of Magnesia, 2, | 2 | 1 0 |
| 7 | Sulphate of Magnesia, 2, | 2 | 8 18 |
| 8 | No Manure, | 2 | 7 93 |
| 9 | Superphosphate, 5; Salt, 3, | 1 | 19 0 |
| 10 | Superphosphate, 5; S. Magnesia, 2; Salt, 3, | 1 | 18 37 |
| 11 | Superphos., 5; S. Magnesia, 2; Mur. Potash, | | |
| | 4; Salt, 3, | 2 | 7 0 |
| 12 | Superphosphate, 5; Mur. of Potash, 2; Salt, 3, | 2 | 2 0 |
| 13 | Muriate of Potash, 4; Salt, 3, | 1 | 13 18 |
| 14 | Mur. of Potash, 4; S. of Magnesia, 2; Salt, 3, | 1 | 16 0 |
| 15 | Sulphate of Magnesia, 2; Salt, 3, | 1 | 15 0 |
| 16 | Salt, 3, | 1 | 13 56 |

All, except plot 8, had besides, later in the spring, about $\frac{3}{4}$ cwts. of sulphate of ammonia.

Series D and E were tried in 1869 on West Wet-flats, a field rather heavier in its nature than Mid-heads; though in better condition as a whole, and especially the part occupied by Series E. But the season was less favourable.

The manures were sown March 6th, and the grass cut and weighed June 25th and 26th. The second cutting was taken August 23rd.

Series F and G were tried in 1870 on the south-west end of the Festival field. The soil—an open, gravelly loam—was lighter than that of any other series, and also more equal; and was in rather poor condition. The season was also less favourable than that of 1868.

The manures were sown March 7th; the grass cut and

Details of Series E and G Hay Experiments.

weighed June 20th and 21st; and the hay weighed July 7th and 9th.

HAY.—SERIES E, 1869.

| No. | Manure in cwts. per Acre. | First Cutting. | Second Cutting | Total Weight. |
|-----|--|----------------|----------------|---------------|
| | | T. C. lbs | C. lbs. | T. C. lbs |
| 1 | Farmyard Manure, (14 tons), | 2 12 10 | 8 34 3 | 0 44 |
| 2 | Clover Manure, 10 cwts., | 2 15 96 | 7 22 3 | 3 6 |
| 3 | Clover Manure, 5, | 2 12 60 | 3 110 2 | 16 58 |
| 4 | No Manure, | 2 2 12 | 5 94 2 | 7 106 |
| 5 | Minerals, 4; Sulph. Ammonia, 1, | 2 13 48 | 4 109 2 | 18 45 |
| 6 | Minerals, 3 $\frac{3}{4}$; Peruvian Guano, 1 $\frac{1}{4}$, | 2 13 35 | 5 54 2 | 18 89 |
| 7 | Minerals, 4; Nitrate of Soda, 1, | 2 17 61 | 4 96 3 | 2 45 |
| 8 | Dissolved Bones, 3 $\frac{3}{4}$; Per. Guano, 1 $\frac{1}{4}$, | 2 16 52 | 4 113 0 | 63 |
| 9 | Bone Dust, 380 lbs.; Per. Guano, 180 lbs. | 2 17 74 | 6 133 3 | 3 87 |
| 10 | Grass Manure, 5 cwts., | 2 15 42 | 5 93 0 | 51 |
| 11 | No Manure, | 2 4 22 | 7 32 2 | 11 54 |
| 12 | Minerals, 4 $\frac{1}{2}$ (wanting Salt), | 2 0 92 | 6 42 2 | 7 22 |
| 13 | Minerals, 4 $\frac{1}{2}$ (wanting Magnesia), | 2 4 4 | 5 52 2 | 9 56 |
| 14 | Minerals, 5 (all four), | 2 5 18 | 7 98 2 | 13 4 |

Mineral manure supplied—Superphosphate, 2 $\frac{3}{4}$ cwts.; muriate of potash, 1 $\frac{1}{4}$ cwts.; sulphate of magnesia, $\frac{1}{2}$ cwt.; and salt, $\frac{1}{2}$ cwt.

HAY.—SERIES G, 1870.

| No. | Manures in lbs. per Acre. | Weight. |
|-----|--|---------------|
| | | T. cwts. lbs. |
| 1 | No Manure, | 1 7 84 |
| 2 | Superphosphate, 440 lbs.; Mur. of Potash, 440, | 1 11 106 |
| 3 | Farmyard Manure, 14 tons; applied Dec. 15th, | 2 7 95 |
| 4 | Grass Manure, 780 lbs.; applied Feb. 19th, . | 2 2 22 |
| 5 | Grass Manure, 780 lbs.; applied April 20th, . | 1 18 67 |
| 6 | Grass Manure, 780 lbs.; applied March 7th, . | 1 11 50 |
| 7 | Grass Manure, 390 lbs.; applied March 7th, . | 1 7 67 |
| 8 | No Manure, | 1 7 28 |
| 9 | Minerals, 580; Nitrate of Soda, 200, | 2 2 17 |
| 10 | Minerals, 580; Sulphate of Ammonia, 200, . | 1 18 28 |
| 11 | Minerals, 550; Peruvian Guano, 230, | 1 15 6 |
| 12 | Dissolved Bones, 550; Peruvian Guano, 230, . | 1 12 6 |

Minerals supplied—Superphosphate, 348 lbs.; muriate of

Details of Series H and I Hay Experiments.

potash, 128 lbs.; sulphate of magnesia, 58 lbs.; and salt, 46 lbs.

HAY.—SERIES H, 1871.

| No. | Manure in lbs. per Acre. | First Cutting. | Second Cutting. | Total Weight. |
|-----|--|----------------|-----------------|---------------|
| | | T. C. lbs. | T. C. lbs. | T. C. lbs. |
| 1 | No Manure, | 1 18 106 | .. | .. |
| 2 | Super., 440; Muriate Potash, 160; Nitrate Soda, 200, | 2 8 106 | .. | .. |
| 3 | Super., 400; Muriate Potash, 140; Per. Guano, 260, | 2 10 106 | .. | .. |
| 4 | Super., 440; Muriate Potash, 160; S. Ammonia, 200, | 2 8 78 | .. | .. |
| 5 | Same as 4, with Salt, 160 lbs., | 2 5 11 | .. | .. |
| 6 | No Manure, | 1 14 106 | 1 4 34 | 2 19 28 |
| 7 | Superphosphate, 440; Muriate Potash, 160, | 1 19 45 | 1 14 73 | 3 14 6 |
| 8 | Superphosphate, 560; Sulphate Ammonia, 200, | 2 5 39 | 1 3 95 | 3 9 22 |
| 9 | Grass Manure, 800 lbs., | 2 4 22 | 1 10 84 | 3 14 106 |
| 10 | Grass Manure, 400 lbs., | 2 0 28 | 1 10 84 | 3 11 0 |
| 11 | Sulphate of Ammonia, 340 lbs., | 2 12 90 | 1 1 106 | 3 14 84 |
| 12 | Nitrate of Soda, 340 lbs., | 2 14 45 | 1 2 22 | 3 16 67 |
| 13 | No Manure, | 1 19 101 | 1 11 89 | 3 11 78 |

HAY.—SERIES I, 1871.

| No. | Manure in cwts. per Acre. | Weight. | |
|-----|--|----------|--------|
| | | T. cwts. | lbs. |
| 1 | Sulphate of Ammonia, 2 cwts., | 1 | 7 56 |
| 2 | Nitrate of Soda, 2 cwts., | 1 | 0 110 |
| 3 | No Manure, | 0 | 11 8 |
| 4 | Superphosphate, 4; Sulphate of Ammonia, 2, | 1 | 12 16 |
| 5 | Super., 4; Mur. Potash, 2; Sulphate Ammonia, 2, | 1 | 14 82 |
| 6 | Super., 4; S. Magnesia, 2; Sulphate Ammonia, 2, | 1 | 10 90 |
| 7 | Super., 4; Muriate of Potash, 2; Nitrate of Soda, 2, | 1 | 7 86 |
| 8 | Super., 4; Muriate of Potash, 2, | 0 | 10 110 |
| 9 | No Manure, | 0 | 8 14 |

Series H and J were tried in 1871 on East Wet-flats. This field had the heaviest soil of any of the series, Gowrie pasture excepted; though not heavy enough to be called a clay loam, being quite friable, and rather dark in colour when damp. It was also in fair condition, and the season was excellent.

The manures were sown March 16th, and the grass cut and weighed June 13th and 16th. The second cutting was taken on September 8th.

Brief Summary of the Results.

Series I was also tried in 1871, but on a soil differing in every respect from those of the preceding series. The field called Gowrie pasture, was an outlying one, distant about a mile from the farm. It had come into our hands in 1870 in very poor condition; and, as its soil was a poor, stiff clay, it was thought to offer a good opportunity for experiment. But its distance from the steading was fatal to its proper management.

The manures were sown April 21st, and the grass cut and weighed June 17th.

Series K was tried in 1872 on Bore-hole field. Half of the field, the part acquired in 1870, was in poor condition. The land was a light gravel, rather resembling that of Series D and E. The season was, however, by far the best we had experienced, as the figures show.

The grass was cut and weighed June 27th.

This concludes the details of these experiments; and it will be well before concluding to recapitulate briefly the more important facts of this chapter.

1st. That the values given for the twelve manures in Table I., page 331, are for Nos. 1, 2, 3, 6, and 7, the averages of many experiments.

2nd. That the values given for Manures Nos. 4, 5, 8, 9, and 10, are doubtful.

3rd. That nitrate of soda, used alone, gave the best return when applied at the rate of 4 cwts. per acre.

4th. That nitrate of soda should in general be used in conjunction with mineral manures: and then at the rate of 1 to 2 cwts. per acre.

5th. That sulphate of ammonia was less reliable than nitrate of soda.

6th. That Peruvian guano did best when used by itself.

7th. That where nitrate of soda gave 100 lbs. of hay, sulphate of ammonia gave 92, and Peruvian guano 74.

Deductions from the Grass Experiments.

8th. That, used in conjunction with mineral manures, *each lb. of nitrogen* gave, from nitrate of soda, $37\frac{1}{2}$ lbs. of hay; from sulphate of ammonia, 25 lbs.; and from Peruvian guano, 24 lbs. of hay.

9th. That the yield from superphosphate was more than doubled by the *presence* of sulphate of ammonia, and increased one-third by the *presence* of muriate of potash.

10th. That the yield from muriate of potash was increased three-fold by the *presence* of superphosphate, and nearly two-fold by the *presence* of sulphate of ammonia; and was decreased more than one-half by the presence of common salt.

11th. That sulphate of potash proved superior to muriate of potash.

12th. That a good general grass manure, is $1\frac{1}{2}$ cwts. nitrate of soda, $1\frac{1}{2}$ cwts. muriate of potash, and 3 cwts. superphosphate or dissolved bones per acre. And that 4 cwts. of gypsum, if obtainable at 1s. per cwt., may with advantage be mixed with this compound.

13th. That in the experiments of 1872, mineral manures applied in autumn, proved superior to nitrogenous manures applied either in autumn or spring.

14th. That, possibly, grass land might be efficiently manured by mineral manures alone.

Annual Rainfall at Blennerhasset.

CHAPTER XX.

FIELD EXPERIMENTS ON POTATOES WITH MURIATE OF POTASH, &c.

AMONGST the numerous experiments tried on the Blennerhasset Farm with nearly all the more important manurial substances, the following were undertaken with the view of testing the profitableness or otherwise of potash salts. The matter of this chapter appeared as a Prize Essay in the Highland and Agricultural Society's Transactions for 1873.

Potatoes being largely grown, were the subject of many experiments; and, in the absence of a sufficiency of farmyard manure, potash naturally suggested itself as a necessary constituent of a chemical potato manure.

The farm was situated about 10 miles south and east of the Solway. It lay between 200 and 300 feet above sea-level, in lat. $54^{\circ} 45'$ and long. $3^{\circ} 17' W$. The fields under experiment had all a northern exposure, and were as a rule light and gravelly in their nature, and with an open subsoil. The rainfall, taken daily for the four years 1868 to 1871, is given below; that of the first half of 1872 has been already given on page 250.

TABLE I.—ANNUAL RAINFALL.

| Months. | 1868. | 1869. | 1870. | 1871. |
|-----------------|-------|-------|-------|-------|
| January . . . | 3·23 | 3·65 | 3·52 | 2·39 |
| February . . . | 4·68 | 5·39 | 1·87 | 2·37 |
| March | 4·53 | 0·54 | 1·32 | 1·98 |
| April | 2·49 | 2·08 | 1·19 | 2·56 |
| May | 2·45 | 2·23 | 2·40 | 0·97 |
| June | 0·67 | 1·24 | 1·46 | 2·31 |
| July | 0·61 | 1·36 | 0·91 | 3·08 |
| August | 4·84 | 1·35 | 2·60 | 3·09 |
| September . . . | 2·06 | 5·91 | 3·37 | 2·84 |
| October | 4·21 | 2·49 | 6·03 | 2·86 |
| November . . . | 2·39 | 4·24 | 2·90 | 2·31 |
| December . . . | 5·81 | 3·33 | 1·24 | 4·78 |
| | 37·97 | 33·81 | 28·81 | 31·54 |

Market Value per Ton of the Potatoes as raised.

Throughout these experiments the questions kept in view were of the two kinds; first, the effects of potash manures upon the potato crop as regards—(1) weight; (2) size; (3) keeping qualities; (4) healthy growth; and secondly, (5) the kind, and (6) the quantity of potash salt most efficient. On many of these points the testimony will be found conflicting and indefinite: facts will be given bearing on all; but only with reference to the first and second, are the results sufficiently uniform and numerous to inspire confidence.

In experiments on potatoes, the weight per acre of the tubers, has too frequently been hitherto, the sole test of value. The quality of the produce as regards the size, &c., of the tubers, has not been altogether overlooked; but the difficulty of assigning it a value, has probably been the chief barrier, to its taking a place in statements of field experiments, second only to that of weight. As an illustration of the value of size, however, it may be mentioned that, in an experiment with large and small potato sets tried in 1869, the produce of two plots resulted as follows:—No. 9 yielded 194½ cwts., value £15 17s. 5½d.; and No. 13, 160½ cwts., value, £19 18s. 1½d. The heavier crop when riddled was found to contain 70·9 per cent. of small or pig potatoes, and the lighter only 15·7; and hence, though 34 cwts. less in weight, the latter proved £4 10s. better in value.

To arrive at the practical value of the size of the tubers, they were assorted into the three customary sizes, as if for the market. In Cumberland hand picking is the rule, but riddles are sometimes used. These are of 1¾ to 1⅞ inches mesh for marketable or eating potatoes; and what pass through this are thrown upon a second riddle of 1⅝ to 1½ inches mesh. The first quality or size consists of tubers weighing 2¼ or 2½ oz. and upwards; and the third, called pig potatoes, of those under 1¼ oz. The prices vary somewhat according to season, but the following are rather under an average:—4½d. per stone of 14 lbs. for the first, 3d. for the second, and 2d. for the third; or per ton, £3, £2, and £1 6s. 8d. respectively. From these prices the sums in the columns headed “Market value per ton,” in the tables which follow, were calculated. The field weights of the three

Method of Weighing the Experimental Crops.

qualities were reduced into per cents., and these multiplied by their respective prices, as in the following example. The field weights of plot 3 E, for instance, were—

| | | | | | | | |
|-------------------------------|------------|-------------|--------------|---|--------|---|--------------|
| Of Large, . | 584 lbs. | = per cent. | 64.7 | × | £3 0 0 | = | £194.1 |
| „ Medium, | 209 „ | = „ | 23.1 | × | 2 0 0 | = | 46.2 |
| „ Small, . | 111 „ | = „ | 12.2 | × | 1 6 8 | = | 16.3 |
| | <u>904</u> | | <u>100.0</u> | | | | <u>256.6</u> |
| Equal to £2 11s. 4d. per ton. | | | | | | | |

EXPERIMENTS IN 1867.—MURIATE OF POTASH:—ALONE AND WITH SUPERPHOSPHATE.

The muriate of potash used between 1867 and 1870 tested 81 per cent.; after 1870, 83 per cent. The variety of potato was rocks; the sets were cut and planted in the usual way, on 7th May; the manure, mixed with soil, being previously sown in the drill bottoms. The season was very favourable till July, when heavy rains set in; disease then made its appearance, and was aggravated by some weeks' delay in lifting. This being also the first field experiment, the speedy and accurate system of weighing afterwards adopted was not in use, and hence, but a small portion of each plot was weighed. This season's weights are in consequence less accurate than those which follow. The method of weighing afterwards adopted was by a spring balance, weighing to 300 lbs., which was tested frequently, and which, being suspended to a portable triangle, was readily moved about from field to field. Frequently the potatoes were twice weighed—before and after being picked. In showery weather, or when damp soil, adhering to the potatoes, seemed likely to increase the weight to any extent, a weighed sample was placed under shelter and re-weighed when marketable; the proportion of loss indicated was then deducted from all that had been weighed that same day, and was rarely found to exceed 4 per cent. The soil in this experiment was in fair condition; the preceding crop had been oats after lea, and had been top-dressed with about 4 cwts. per acre of bone manure.

When the crop was lifted on 29th October, many of the diseased tubers were so rotten as to be quite unweighable.

Potash seems to Mitigate the Potato Disease.

The particulars as to manuring and the produce were as follows :—

TABLE II.—SERIES OF 1867.

| No. | Manures in cwt. per acre. | Weight of Potatoes. | | Per cent. diseased. |
|-----|---|---------------------|-------|---------------------|
| | | T. cwt. | lbs. | |
| 1 | Farm-yard manure, 15½ tons per acre . | 7 | 18 91 | 26·0 |
| 2 | No manure | 5 | 17 63 | 17·5 |
| 3 | Mineral superphosphate, 4 cwt. | 5 | 19 70 | 29·3 |
| 4 | Superphos., 4; muriate of potash, 4 cwt. | 6 | 8 101 | 16·8 |
| 5 | No manure | 3 | 12 21 | 20·0 |
| 6 | Muriate of potash, 4 cwt. | 6 | 14 98 | 18·5 |
| 7 | Common salt, 4 cwt. | 4 | 2 56 | 20·0 |
| 8 | Superphosphate, 4; and salt, 4 cwt. | 3 | 8 7 | 33·3 |
| 9 | No manure | 4 | 7 73 | 35·3 |
| 10 | Farm-yard manure, 8½ tons | 11 | 8 105 | 41·5 |

The excessive weight of plot 10 is probably due to its position on the headrigg of the field, where the soil is frequently better manured by the cattle who stand there for shelter in inclement weather. This element of irregularity was noted, and avoided in future experiments.

Plot 4 as compared with 3; and 6 as compared with 7 and 5; show notable increase from the addition of muriate of potash. The disease column is also interesting; and at the time was thought to be conclusive in favour of potash. Further consideration of this experiment is, however, deferred until the details of all the series are given, when the results of all will be arranged and averaged together.

SERIES A AND E—1868 AND 1869.

In 1868, four series of experiments were begun, and continued on the same land for three years. Each plot consisted of four stetches or drills, 30 inches wide and 36 yards long, and measured $\frac{1}{40}$ th of an acre each. The drills ran north and south, and were divided lengthwise into four plots or series, A, B, C, and D; of these A occupied the most southerly, and best conditioned portion. A slack or hollow

Experiments tried for the Royal Agricultural Society.

of heavier soil lay to one side, interfering slightly with the easterly plots of series B, and with the adjacent ends of A and C. The soil otherwise was very equal across the plots. The previous crop had been swedes after flax, the roots having all been carted off.

Series E, being a repetition of A, is included in the same table. The field in which it was tried was more equal and level, the soil was also heavier, but in poorer condition; and the season less favourable. The preceding crop had been oats after lea, unmanured. The plots measured $\frac{1}{20}$ th of an acre each; the date of planting was 30th April, and of lifting 21st Oct.; for series A these were 4th May and 5th Oct. respectively. The variety of potato was regents or rough whites. This kind was in fact used in nearly all the experiments; and, as a rule, a change of seed was obtained each season, generally from Lanarkshire. The sets were cut to about $1\frac{1}{2}$ ounces, and set from 8 to 12 inches apart.

TABLE III.—SERIES A AND E.

| No. | Manures in cwts. per acre. | A 1868. | | | | E 1869. | | | |
|-----|--|---------------------------|-----------------------|---------------------------|--|----------------------------|-----------------------|--|--|
| | | Weight. | Market value per ton. | Percent. sound in Spring. | | Weight. | Market value per ton. | | |
| 1 | No manure | <i>T. C. lbs.</i> £ s. d. | | | | <i>T. cwt. lb.</i> £ s. d. | | | |
| 2 | Superphosphate, 4; m. of potash, 2; and s. of ammonia, 2 | 6 4 72 | 2 10 2 $\frac{3}{4}$ | .. | | 3 8 4 | 2 7 1 $\frac{3}{4}$ | | |
| 3 | Farm-yard manure, 20 tons | 9 2 16 | 2 9 4 | 71.5 | | 7 0 100 | 2 11 5 | | |
| 4 | Superphosphate, 4; m. of potash, 4 | 9 3 24 | 2 8 7 $\frac{1}{4}$ | 67.8 | | 8 1 48 | 2 11 4 | | |
| 5 | No Manure | 7 6 88 | 2 8 8 $\frac{3}{4}$ | 89.3 | | 6 15 80 | 2 11 4 | | |
| 6 | Superphosphate, 4; m. of potash, 4; and nitrate of soda, 2 | 5 13 64 | 2 9 9 $\frac{1}{4}$ | 86.0 | | 3 11 8 | 2 7 9 | | |
| 7 | Peruvian guano, 4 cwt. | 7 11 82 | 8 11 $\frac{1}{2}$ | 83.0 | | 6 4 72 | 2 10 9 | | |
| 8 | Superphosphate, 4; salt, 4 | 6 7 96 | 2 6 11 $\frac{1}{2}$ | 81.2 | | 4 11 28 | 2 8 0 | | |
| 9 | Farm-yard manure, 20 tons | 5 13 64 | 2 8 4 $\frac{1}{2}$ | 84.8 | | 4 17 36 | 2 9 5 $\frac{1}{2}$ | | |
| 10 | No manure | 8 2 96 | 2 9 11 $\frac{1}{4}$ | 79.4 | | 7 12 56 | 2 10 4 $\frac{1}{2}$ | | |
| | | 5 6 88 | 2 10 9 $\frac{3}{4}$ | .. | | 3 16 108 | 2 7 6 $\frac{1}{2}$ | | |

A comparison of plots 4 and 8, in both series, renders it very evident that a soda salt cannot take the place of a potash one; and on plot 8 A, salt seems almost to have reduced the produce.

Another noteworthy circumstance is, the increase of weight given by plot 2 over 4, where 2 cwts. of sulphate of

Excessive Manuring with Soluble Salts.

ammonia were substituted for two of muriate of potash. This increase, 35 cwts. in A, is less marked in E, being only 5 cwts. Probably this is due to the stiffer nature of the soil, as suggested by Dr. Voelcker,* who planned the above experiments, and in whose report for 1870 they appeared. This point will be again considered in connection with other experiments.

SERIES B.—1868, 1869, AND 1870.

The details of this series are the same as for A. Nitrogenous manures were not at first employed in these experiments: the results of 1868 are therefore given by themselves. In consequence, also, of the difference of soil on plots 1, 2, and 3, they are omitted from the series, and the numbers begin at 4.

TABLE IV.—SERIES B, 1868.

| No. | Manures in cwts. per acre. | Weight. | | | Market value per ton. | | |
|-----|--|---------|------|-----|-----------------------|----|----------------|
| | | T. | cwt. | lb. | £ | s. | d. |
| 4 | Superphosphate, $6\frac{1}{2}$; m. of potash, $6\frac{1}{2}$; and (cd.) sulphate of magnesia, $2\frac{1}{4}$. | 7 | 2 | 27 | 2 | 6 | 8 |
| 5 | Superphosphate, $6\frac{1}{2}$; and m. of potash, $6\frac{1}{2}$. | 7 | 8 | 67 | 2 | 10 | $0\frac{3}{4}$ |
| 6 | Superphosphate, $6\frac{1}{2}$ | 7 | 3 | 4 | 2 | 9 | $3\frac{1}{2}$ |
| 7 | Superphosphate, $6\frac{1}{2}$; and s. of magnesia, $2\frac{1}{4}$. | 6 | 12 | 79 | 2 | 8 | $5\frac{1}{2}$ |
| 8 | (Calcined) sulphate of magnesia, $2\frac{1}{4}$. | 6 | 7 | 105 | 2 | 10 | 6 |
| 9 | No manure | 5 | 18 | 45 | 2 | 11 | 9 |

The absence of nitrogenous manure, and the invariably injurious effects which, in a hot, dry season such as 1868, result from a large dressing of soluble salts; combine to make this experiment an imperfect one. Six and a-half cwts. of muriate of potash were evidently in excess of the requirements of the crop. Plot 4 shows also, how a further addition of $2\frac{1}{4}$ cwts. of a soluble salt reduced the produce and quality; though the same, applied alone, as on plot 8, gave a notable increase.

* Journal of the Royal Agricultural Society of England for 1870, page 412.

Ammonia almost useless in the absence of Potash.

In 1869 and 1870, sulphate of ammonia was applied on two plots, the quantities of the other manures reduced, and plot 8 fully manured. The weights of manure given in the table are those of 1869; in 1870 they were increased one-fourth. The date of planting in 1869 was 18th of April, of lifting 27th Sept.; and in 1870, 3d April and 29th Sept. To avoid needless repetition in the table, "s" has been used for "Sulphate of," and "m" for "Muriate of."

TABLE V.—SERIES B, 1869 AND 1870.

| No. | Manure in cwts. per acre. | 1869. | | | 1870. | | |
|-----|--|--------------------|----------------|-----------------------|--------------------|----------------|-----------------------|
| | | Weight. | | Market value per ton. | Weight. | | Market value per ton. |
| | | <i>T. cwt. lb.</i> | <i>£ s. d.</i> | | <i>T. cwt. lb.</i> | <i>£ s. d.</i> | |
| 4 | Superphosphate, 4; m. of potash, 2 | 6 13 64 | 2 9 0 | | 6 15 0 | 2 6 11½ | |
| 5 | Superphosphate, 4; m. potash, 2; and s. ammonia, 2 | 9 2 16 | 2 6 4¾ | | 8 3 24 | 2 3 10½ | |
| 6 | Superphosphate, 4; s. ammonia, 2 | 5 7 96 | 1 19 9½ | | 4 10 40 | 1 15 11¾ | |
| 7 | Superphosphate, 4 cwt. . . . | 5 1 48 | 2 5 0 | | 4 0 80 | 1 19 8¾ | |
| 8 | Superphosphate, 4; m. potash, 2; s. magnesia, ¾; and s. ammonia, 2 | 8 3 104 | 2 6 4¾ | | 7 8 104 | 2 4 10½ | |
| 9 | No manure | 4 14 32 | 2 7 2½ | | 3 4 32 | 1 18 6¾ | |

The above results are very remarkable. On plot 6, without potash, sulphate of ammonia can increase the produce only 6½ cwts. (as over 7); whereas, with potash, as on plot 5, it increases it by nearly 49 cwts. (as over 4). This is a very striking illustration, of how a powerful nitrogenous manure may prove almost useless, in the absence of some other necessary element. In 1870, which was a very favourable potato season, the result is the same, though less marked.

The absence of potash tells very markedly on plots 6 and 7, both as affecting the weight and value. In weight, plot 7 has fallen off 39 per cent. the third year, whilst plot 4,

Farm-yard Manure aided by Muriate of Potash.

with potash, only falls 5'1; and in quality or value the difference is 7s. 2¾d. per ton.

Taking an average of the two plots 5 and 8, the addition of potash increased the produce (as over plot 6) by 65¼ cwts. in 1869, and 65¾ cwts. in 1870. And if we include the increased market value per ton, arising from the greater proportion of potatoes large enough for table use; we find *that the field value of each cwt. of muriate of potash in 1870 was £3 2s. 8d.*

These remarkable results, being obtained under the exceptional conditions of a second year's potato crop, cannot, of course, be taken as applicable under ordinary farming conditions, except on some special soils. They are of value, however, as showing the after-condition of the soil, subsequent upon the removal of a good crop of potatoes.

The soil of this experiment was in no way special; as is evidenced by its returns in Series A, B, C, D, and F. The field in which these experiments were tried, occupied 6 acres of the south-west corner of Mire-Ings.—(*See Frontispiece.*)

SERIES C.—1868, 1869, AND 1870.—(*See Table on page 373.*)

Muriate of Potash with Lime, Salt, and Farmyard Manure.

Series C was originally planned as an anti-disease experiment; but, unfortunately (or rather fortunately), no disease appeared during the three years of its continuance. Perhaps, however, by practical farmers it may be looked upon as the most valuable experiment of all; as it is the only one in which muriate of potash was used in conjunction with farm-yard manure.

The dates of planting, the seed, &c., were the same as in A and B of these years. The manures given in the table are those of 1868, which, with a few exceptions, were continued with but little alteration over the three years. The first three plots were manured alike, after 1868, with Peruvian guano 3 cwts., and salt 1½ cwts. per acre. Other minor alterations will be found in the foot notes.

In the table, "potash" stands for muriate of potash, and manures not continued after 1868 are placed in parentheses.

| No. | Manures and Weights per Acre. In 1868. | 1868. | | | Per Cent. Good in Spring. | 1869. | | | Per Cent. Good in Spring. | 1870. | | | Three Years' Total Value per Acre. | | | | | | | | | |
|-----------------|--|---------|-----------------------------|------------|---------------------------------------|---------|-----------------------------|-----------|---------------------------------------|---------|-----------------------------|----------------|--|------------|----------|-----------|-----------|----------------|------------|----------|-----------|-----------|
| | | Weight. | Market Value per Ton. | | | Weight. | Market Value per Ton. | | | Weight. | Market Value per Ton. | | | | | | | | | | | |
| | | | <i>T. cwt.</i> | <i>lb.</i> | | | <i>£</i> | <i>s.</i> | | | <i>d.</i> | <i>T. cwt.</i> | | <i>lb.</i> | <i>£</i> | <i>s.</i> | <i>d.</i> | <i>T. cwt.</i> | <i>lb.</i> | <i>£</i> | <i>s.</i> | <i>d.</i> |
| 1 ¹ | (Farm-yard manure, 15 tons) . . . | 8 | 17 | 96 | 2 | 10 | 0 | 4 | 71 | 4 | | 7 | 2 | 16 | 2 | 5 | 1 | 4 | 53 | 4 | 2 | |
| 2 ¹ | (Farm-yard manure, 15 tons; potash, 264 lbs.; salt, 264; lime, 352) . . | 8 | 16 | 48 | 2 | 11 | 2 | 1 | 62 | 5 | | 8 | 10 | 40 | 2 | 6 | 3 | 61 | 8 | 5 | 1 | |
| 3 ¹ | (Farm-yard manure, 10 tons; potash, 264 lbs.; salt, 264; lime, 352) . . | 8 | 10 | 40 | 2 | 11 | 2 | 1 | 73 | 2 | | 7 | 7 | 56 | 2 | 5 | 2 | 4 | 56 | 12 | 5 | |
| 4 ² | Farm yard manure, 10 tons; potash, 132 lbs.; salt, 132; lime, 176 . . | 7 | 14 | 72 | 2 | 11 | 9 | 3 | 70 | 2 | | 7 | 13 | 104 | 2 | 7 | 6 | 4 | 57 | 19 | 11 | |
| 5 ³ | Farm-yard manure, 10 tons; salt, 176 lbs.; lime, 264 . . . | 7 | 0 | 80 | 2 | 9 | 2 | | 76 | 5 | | 6 | 11 | 48 | 2 | 5 | 8 | 4 | 47 | 6 | 1 | |
| 6 ⁴ | Farm-yard manure, 10 tons; (potato manure, 440 lbs.) . . . | 8 | 2 | 56 | 2 | 9 | 3 | 1 | 70 | 5 | | 6 | 3 | 104 | 2 | 2 | 7 | 4 | 3 | 45 | 12 | 2 |
| 7 ⁵ | Per. Guano, 110 lbs.; salt, 802 lbs. | 5 | 16 | 82 | 9 | 5 | 3 | 4 | 79 | 8 | | 5 | 0 | 40 | 2 | 4 | 11 | 4 | 7 | 35 | 6 | 9 |
| 8 | No Manure . . . | 5 | 11 | 82 | 10 | 9 | 3 | 4 | 80 | 5 | | 4 | 8 | 104 | 2 | 6 | 3 | 4 | 2 | 18 | 11 | 6 |
| 9 ⁶ | Salt, 230 lbs.; and lime, 450 lbs. . . | 6 | 6 | 82 | 12 | 3 | 1 | 2 | 72 | 7 | | 5 | 2 | 96 | 2 | 8 | 2 | 2 | 3 | 104 | 15 | 8 |
| 10 ⁷ | Potash, 204 lbs.; salt, 204 lbs.; and lime, 272 . . . | 6 | 11 | 48 | 2 | 11 | 8 | 1 | 64 | 2 | | 5 | 11 | 48 | 2 | 9 | 1 | 1 | 3 | 104 | 15 | 8 |
| 11 ⁸ | Slaked lime, 8 cwts. . . . | 6 | 5 | 40 | 2 | 11 | 3 | 1 | 81 | 7 | | 4 | 12 | 96 | 2 | 8 | 0 | 4 | 3 | 104 | 15 | 8 |

1 Peruvian guano, 3 cwt.; salt, 1½ cwt. in 1869 and 1870, and no farm-yard manure.

2 140 lbs. potash; 80 lbs. salt, and 200 lbs. lime in 1869 and 1870.

3 160 lbs. salt and 280 lbs. lime in 1869 and 1870.

4 No potato manure after 1868.

5 P. guano, 3 cwt.; and salt, 1½ in 1869; superphosphate, 4; m. potash, 2; and s. ammonia 2 in 1870.

6 Increased to 340 lbs. and 560 lbs. in 1869 and 1870.

7 Increased to 280 lbs., 170 lbs., and 450 lbs. in 1869 and 1870.

8 4 cwt. of gypsum and 4 cwt. lime after 1868.

Potash highly profitable as an aid to Farm-yard Manure.

Beginning with plots 1 and 2, it will be observed that the latter shows in 1868 no increase over the former from the addition of potash; looking, however, at the marked increase on plots 3 and 4 over 5, it seems probable that the 8 cwts. of mixed manures in 2 was an overdose, when used with 15 tons of farmyard manure. Used with only 10 tons, as in plot 3, it increased the weight by nearly 30 cwts. as over plot 5, manured with both lime and salt. Though inactive the first year, the potash on plot 2 more than made up the deficiency in 1869, when it gave an increase of over 34 cwts., and in 1870 of 28 cwts.

Coming now to plot 3, which had twice as much potash as plot 4, we get the very satisfactory increase of about 16 cwts. from the additional $1\frac{1}{4}$ cwts. of muriate of potash. Beyond the first year, the comparison between these two does not hold good, plot 4 having, in addition, farmyard manure every year. This latter plot gives results equally satisfactory. Over plot 5, dressed with lime and salt throughout, it gave the first year nearly 14 cwts.; the second, 31 cwts.; and the third, 22 cwts. more weight; and over the three years combined, £10 14s. 9d. of increased value; the result of $3\frac{3}{4}$ cwts. of muriate of potash.

Plot 6 also received potash, the potato manure containing 50 lbs. of the muriate, as well as 55 of salt, 154 of superphosphate, 80 of Peruvian guano, and 39 of sulphate of ammonia. Though the weight of the crop surpassed that on plot 4, the quality was inferior; so much so, that the acreage value of the two plots differed only by 2d., that of 6 being £20 os. 6d., and of 4, £20 os. 8d. Probably the potato manure was too rich in nitrogen for a merely auxiliary manure.

Plot 7 was the trial of a French receipt against disease; the result would, however, seem to prove it also a receipt against a crop.

Coming next to plots 9, 10, and 11, where the potash, salt, and lime mixtures were applied alone, we do not find the results so favourable; for though all three, when compared with 8, paid for the manures; the plot with potash (10) did not do so the first season, when compared with 9

Lime: its action as a Manure for Potatoes.

and 11; showing that lime was at first the most active ingredient of the three. Looking, however, at the weight columns, and the three years' acreage value, it will be seen that, while the other two plots became rapidly exhausted—having fallen off 49·3 and 54·3 per cent. by 1870—the plot with potash had fallen off but 29·6 per cent.; and had given returns worth more by £5 4s. 1½d. Its profitableness in this case is, however, only comparative, the third year's crop being worth but £9 2s. 2½d. per acre. This mixture cannot, therefore, be recommended as a suitable one for use, apart from farmyard manure.

It is noteworthy, that on plot 11, treated with lime alone, a very considerable increase over no manure was obtained at first, but by the third year the crop was inferior both in weight and quality to that from no manure. This supports the theory that lime is partly of the nature of a stimulant, and that when used frequently, and without a supply of other manures, it tends to rapid exhaustion of the soil.

The muriate of potash and salt used in the above mixtures were first partially dissolved in a large stoneware trough; and after lying some time, the lime in a hot state was added; the whole well mixed, and allowed to lie some days before use.

Before leaving this experiment, it may be well to draw attention to the fact that, by the third year, plot 3 shows 8 cwts. of the potash, salt, and lime mixture more than equal to the extra 5 tons of farmyard manure on plot 1. That this increase is due almost entirely to the 264 lbs. of muriate of potash, was shown when plots 4 and 5 were under discussion.

SERIES D.

Muriate and Sulphate of Potash, Nitrogenous Manures, &c.

Series D had a sharper and more equal soil than any previous. The dates, &c., were the same as for C. The weights of manure given are those of 1869, when 8 cwts. per acre was applied; in 1868 the quantity was 6 cwts., and in 1870, 10 cwts. The mineral manure consisted of superphosphate, 45 per cent.; muriate of potash (sulphate, on

Sulphate *versus* Muriate of Potash.

plot 1), 30 per cent. ; sulphate of magnesia, 15 per cent. ; and salt, 10 per cent. The composition was slightly different in 1868 and 1870.

Plot 1, it will be observed, which got sulphate of potash (testing 83·4 per cent.), gave a better return in 1868 than plot 2 with the muriate. In 1869, the contrary was the case; and suspecting the cause to be local, the manures were transposed, plot 1 receiving the muriate, and 2 the sulphate of potash. In 1870, the muriated plot was again inferior; a result somewhat perplexing, and one compelling the rejection of the weights of 1869 and 1870. In this connection it may not be out of place to mention that the outside drill was not included in the experiment, as being from its position more liable to accident, &c. This leaves us with but one reliable experiment on sulphate *versus* muriate of potash, and it shows the former superior. The discussion of this question will be again resumed when the "kind of potash salt" is under consideration.

Looking now at plots 3, 4, and 5, on which about 2 cwts. of nitrogenous manures were substituted for about 2 cwts. of the mineral manure of plot 2, it will be observed that the nitrogenous manures very considerably increased the produce all through; insomuch that the three years' value exceeds that of plot 2 by about £4. It is also noteworthy, however, that with a favourable season and 10 cwts. of a very complete manure, the third year's crop of plot 5 was worth only about £11 10s. per acre.

Plot 8, receiving dissolved bones and Peruvian guano, resembles plot 6, series B, *in the absence of potash*; and was introduced as a contrast to plot 5. By the third season it has fallen off 41 per cent. in weight, and considerably in quality; while plot 5, with potash, has fallen off only 22·6 per cent. This concludes the continuous three years' series.

TABLE VII.—SERIES D.

| No. | Manures per Acre in 1869. | 1868. | | | 1869. | | | 1870. | | Three years. |
|-----|---|------------|-----------------------|---------------------------|------------|-----------------------|---------------------------|------------|-----------------------|--------------------|
| | | Weight. | Market value per ton. | Per cent. sound in spring | Weight. | Market value per ton. | Per cent. sound in spring | Weight. | Market value per ton. | |
| | | T. C. lbs. | £ s. d. | | T. C. lbs. | £ s. d. | | T. C. lbs. | £ s. d. | |
| * 1 | Mineral manure, 8 cwts. (with sulphate of potash) | 6 3 104 | 2 11 4 | 86·0 | 4 13 24 | 2 6 0 | 94·7 | 4 8 24 | 2 4 5½ | £ s. d. 38 6 7½ |
| * 2 | Mineral manures, 8 cwts. | 5 19 32 | 2 7 1½ | 90·3 | 5 5 80 | 2 6 11½ | 97·9 | 5 2 16 | 2 5 10 | 36 5 2½ |
| * 3 | Mineral manure, 720 lbs.: nitrate of soda, 180 lbs. | 5 11 86 | 2 8 5½ | 90·2 | 5 14 72 | 2 5 9½ | 100·0 | 5 13 30 | 2 4 9½ | 39 7 2½ |
| † 4 | Mineral manure, 720 lbs.: s. ammonia, 180 lbs. | 7 11 88 | 2 7 0 | 88·4 | 6 0 40 | 2 0 4 | 95·9 | 5 4 72 | 2 1 10½ | 40 18 7 |
| § 5 | Mineral man., 680 lbs., and per. guano, 220 lbs. | 6 17 96 | 2 7 5½ | 89·3 | 5 18 64 | 2 3 3½ | .. | 5 6 88 | 2 3 1 | 40 13 8½ |
| § 6 | Potato manure, 900 lbs. | 6 1 88 | 2 5 2 | 85·7 | 6 10 80 | 2 4 9½ | 94·0 | 5 8 24 | 2 3 2½ | 40 1 8 |
| § 7 | Bone dust, 560 lbs., and Per. guano, 340 lbs. | 6 2 56 | 2 3 4 | 89·3 | 5 13 24 | 2 3 8½ | 94·2 | 4 2 16 | 2 0 5½ | 33 19 0½ |
| § 8 | Dissolved bones, 680 lbs., & Per. guano, 220 lbs. | 6 8 64 | 2 6 6 | 83·9 | 5 13 64 | 2 3 5½ | .. | 3 15 80 | 1 19 5½ | 34 14 10½ |
| 9 | No manure | 4 19 32 | 2 10 1½ | 83·5 | 4 5 40 | 2 6 1½ | .. | 2 8 24 | 1 17 8½ | 26 16 7 |
| 10 | Peruvian guano, 330 lbs., and salt, 170 lbs. | 7 5 40 | 2 8 4½ | 88·4 | 5 18 104 | 2 3 8½ | 95·4 | 4 18 104 | 2 0 9½ | 40 13 5 |
| 11 | Peruvian guano, 330 lbs., and salt, 170 lbs. | 6 9 72 | 2 8 10 | 83·6 | 6 3 64 | 2 4 6½ | 95·1 | 3 18 104 | 2 2 2½ | 37 18 5 |

* Manures transposed in 1870.

† 170 lbs. nitrate of soda in 1868, and 320 lbs. in 1870.

‡ 170 lbs. sulphate of ammonia in 1868, and 320 lbs. in 1870.

§ 170 lbs. guano in 1868, and 360 lbs. in 1870.

|| 1120 lbs. of potato manure in 1868, and 660 lbs. of 1869 manure in 1870.

b Farmyard manure, 10 tons in 1868, and same as No. 10 in 1870.

Experiments with Kainit.

SERIES F—*Kainit* versus *Muriate of Potash*.

Series F was tried in 1870 on a sharp gravelly loam, sloping gently to the north; a narrow belt of stiffish soil ran up the middle of the field, crossing plots 4 to 7, and rendering them very unequal. Being desirous, however, of testing kainit that season, and having no other field convenient, the experiment was so planned as to give four plots with each salt. The central plots, 4, 5, and 6, were also excluded from the plan, thus reducing the disturbances from soil variation to a minimum. Plots 2, 7, and 11, treated with the same manure, show, however, a varying state of the soil, and incline us to accept even the average results with caution. In the absence, however, of any other experiments on this point, and supported as the results are by other facts in this volume, the series is not without a value.

The preceding crop had been barley top-dressed with nitrate of soda, which left the soil in poor condition. The date of planting was 27th April, and of lifting 5th October.

TABLE VIII.—SERIES F.

| No. | Manures in cwt. per acre. | Weight per acre. | | | Market value per ton. | | | Value per acre. | | |
|-----|---|------------------|------|----|-----------------------|----|------------------|-----------------|----|----|
| | | T. cwt. | lbs. | | £ | s. | d. | £ | s. | d. |
| 1 | Superphosphate, 6; muriate of potash, 2; sulphate of magnesia, 1; salt, 1; and shoddy, 4 cwt. . | 5 | 12 | 96 | 1 | 17 | 4 $\frac{3}{4}$ | 10 | 11 | 1 |
| 2 | Superphos., 6; kainit, 4; shoddy, 4 | 9 | 5 | 0 | 1 | 17 | 4 $\frac{1}{4}$ | 11 | 15 | 0 |
| 3 | Superphosphate, 6; muriate of potash, 2; shoddy, 4 | 7 | 4 | 32 | 1 | 19 | 0 $\frac{3}{4}$ | 14 | 1 | 10 |
| 7 | Superphos., 6; kainit, 4; shoddy, 4 | 7 | 7 | 16 | 2 | 2 | 3 $\frac{3}{4}$ | 15 | 11 | 0 |
| 8 | Superphosphate, 6; muriate of potash, 2; shoddy, 4 | 6 | 17 | 16 | 1 | 19 | 6 $\frac{3}{4}$ | 13 | 12 | 4 |
| 9 | Superphosphate, 6; muriate of potash, 2; Peruvian guano, 2 $\frac{1}{2}$. | 5 | 21 | 88 | 1 | 14 | 10 $\frac{1}{2}$ | 9 | 15 | 0 |
| 10 | Superphosphate, 6; kainit, 4; Peruvian guano, 2 $\frac{1}{2}$ | 4 | 19 | 32 | 1 | 13 | 7 $\frac{1}{4}$ | 8 | 6 | 10 |
| 11 | Superphos., 6; kainit, 4; shoddy, 4 | 5 | 5 | 40 | 1 | 13 | 2 $\frac{1}{2}$ | 8 | 15 | 0 |

The Potato Disease comes at Last.

Taking the average of the four kainit plots, Nos. 2, 7, 10, and 11, we get 5 tons 19 cwts. and 22 lbs., value £11 1s. 11½d. per acre; on the other hand, the four muriate of potash plots, Nos. 1, 3, 8, and 9, give 6 tons 6 cwts. 58 lbs., value £12 0s. 0¾d. This shows the muriate superior in weight by 7 cwts. and 36 lbs., and in value 18s. 1¼d. If we charge the kainit at 4s. per cwt. on the land, and the muriate of potash at 11s.; the latter stands superior by 12s. per acre, and proves worth 13s. per cwt. more than the kainit.

Plot 1, dressed with 1 cwt. of sulphate of magnesia and 1 cwt. of salt, in addition to the 2 cwts. of muriate of potash, does not appear to have derived any benefit from the addition.

SERIES G, H, AND I.

Sulphate of Ammonia and Superphosphate, with and without Muriate of Potash.

In 1871, two sets of rotation experiments were planned, one upon a soil over-cropped, and in poor condition; the other upon a comparatively new and well-conditioned soil.

Series G was on a sharp, sandy gravel. The preceding crops had been oats in 1870, wheat in 1869, and potatoes, half dunged, in 1868. This field (South-east of Longlands) had been constantly under tillage, not having been once in hay for at least nine years. It was in consequence very poor, and failed to grow an experimental crop of oats in 1871; though several of the plots were liberally dressed with both nitrogenous and mineral manures.

The variety of potato used in these experiments was regents; which were planted in the usual way on 25th March, and lifted on the 25th October.

The year 1871 will long be remembered in Cumberland for its wet summer and bad potato crop. In the previous season the 64 acres on the farm had given an average yield of about 8½ tons per acre; but in this year the 100 acres of potatoes averaged but some 5⅓ tons, more than half of which were diseased. In the experiments of this year, the

Muriate of Potash on an over-cropped Soil.

diseased were carefully sorted from the healthy tubers ; and their weights, calculated into percentages, will be found in the tables. To preserve uniformity, however, the "market value per ton" was calculated on the gross weights of good and bad.

TABLE IX.—SERIES G.

| No. | Manure per acre. | Weight per acre. | | | Market value per ton. | | | Value per acre. | | | Per cent. dis- eased. |
|-----|---|------------------|------------|----|-----------------------|-----------|----|-----------------|-----------|----|-----------------------|
| | | <i>T. cwt.</i> | <i>lb.</i> | £ | <i>s.</i> | <i>d.</i> | £ | <i>s.</i> | <i>d.</i> | | |
| 1 | Superphos., 9 cwt. ; and sul- phate of ammonia, 3 cwt. | 4 | 19 | 72 | 1 | 17 | 3 | 9 | 5 | 7 | 27·8 |
| 2 | Superphos., 9 cwt. ; muriate of potash, 3½ cwt. ; and sulph. of ammonia, 3 cwt. | 5 | 9 | 12 | 2 | 3 | 11 | 11 | 19 | 6 | 57·2 |
| 3 | No manure | 1 | 17 | 36 | 1 | 16 | 3½ | 3 | 7 | 9 | 39·2 |
| 4 | Superphos., 9 cwt. ; muriate of potash, 3½ cwt. ; and sulph. of ammonia 3 cwt. | 5 | 9 | 92 | 2 | 7 | 4¾ | 12 | 19 | 10 | 70·0 |
| 5 | Farm-yard manure, 20 tons | 5 | 5 | 80 | 2 | 1 | 6 | 10 | 19 | 5 | 58·1 |

The great poverty of the soil in this case cannot fail to strike the reader. Plot 3 with no manure yields but 37¾ cwts., whereas, even after three successive potato crops, the lowest return previously obtained, had been over 48 cwts. The small yield on plots 2, 4, and 5, in spite of heavy manuring, is also proof of the low condition of the soil.

On plot 1, while superphosphate and sulphate of ammonia gives a great increase of weight as compared with No. 3, the quality (*i.e.*, value per ton) remains very low in the absence of potash. The addition of this, as on plot 2, it will be observed, at once raised the quality 6s. 8d. per ton.

Looking now at the disease column, it will be noticed that the two potash plots, Nos. 2 and 4, show a large proportion ; so much so that one cannot but suspect some connection between the two circumstances. The experiment of 1867, and one to be presently given, show, however, that the simple presence of potash cannot have been the active cause ;

Muriate of Potash on a highly-conditioned Soil.

and suggest that quantity rather than quality of manure have led to the failing. It will be noticed that plots 2 and 4 were dressed with $15\frac{1}{2}$ cwts. per acre of manure, a quantity not excessive under ordinary circumstances, but probably too much on a soil so low in condition as the one under experiment. Farmyard manure, it will be seen, had also a large portion diseased; a circumstance tending to strengthen the conclusion that quantity greatly influenced the proportion. It is somewhat strange, too, that plot 4 should be so much more diseased than plot 2, the manures being the same, and the crops almost identical in weight.

There was in this experiment no appreciable loss from soft, rotten tubers, the soil being dry and open, and the crop raised in good season.

SERIES H.—1871.

This series was tried on a soil superior in all respects to the preceding one, the unmanured plots yielding a crop superior in weight and quality to the best manured of series G. The soil also was more loamy; and the field, having laid in grass for several years, was in good condition. In 1869 it had been mown for hay, and in 1870 broken up for oats. The field was named Manure-croft.

This series had also been planned for rotation, and the first four plots were in turnips. The variety of potato used was rocks; the date of planting 27th April, and of lifting 24th October. The plots were five drills each, and 58 yards long; measuring one-twentieth of an acre.

Plot 6, it will be seen, gives a good return for the $2\frac{1}{2}$ cwts. of potash, exceeding plot 7 in weight by nearly 1 ton, and in value by £3 10s. 6d. per acre. It is also noteworthy that in this experiment the proportion of diseased tubers is practically the same whether potash be absent or present; plots 6 and 7 being in every respect, except quantity, similarly manured to plots 1 and 2 of Series G. Plot 11, it will be observed, with an increased quantity of manure, has also an increased proportion of diseased tubers. Plots 12 and 14 furnish, however, a notable exception, the former being more heavily manured and less diseased than the latter. The

Ammonia not so useful on a rich Soil.

same plots are also exceptional in the matter of weight,—the one with the less quantity of manure giving the heavier crop.

TABLE X.—SERIES H.

| No. | Manure in cwts. per acre. | Weight per acre. | | Market value per ton. | | | Value per acre. | | | Per cent. diseased. | |
|-----|--|------------------|------------|-----------------------|-----------|-----------|-----------------|-----------|-----------|---------------------|------|
| | | <i>T. cwt.</i> | <i>lb.</i> | £ | <i>s.</i> | <i>d.</i> | £ | <i>s.</i> | <i>d.</i> | | |
| 6 | Superphos., 6¼; mu. of potash, 2½; and sulphate of ammonia, 2½ | 8 | 18 | 24 | 2 | 12 | 11¼ | 23 | 11 | 8½ | 42·9 |
| 7 | Superphosphate, 6¼; and sulphate of ammonia, 2½ | 7 | 18 | 64 | 2 | 10 | 7¼ | 20 | 1 | 2½ | 42·1 |
| 8 | No manure | 6 | 15 | 20 | 2 | 8 | 7¼ | 16 | 8 | 6 | 42·1 |
| 9 | Superphos., 6¼; and muriate of potash, 2½ | 8 | 6 | 108 | 2 | 12 | 8¾ | 22 | 0 | 2 | 41·3 |
| 10 | Sulphate of ammonia, 2½ | 6 | 7 | 76 | 2 | 9 | 9 | 15 | 17 | 7 | 45·0 |
| 11 | Superphos., 12½; m. of potash, 5; and sulphate of ammonia, 3¾ | 7 | 4 | 52 | 2 | 10 | 7¼ | 18 | 5 | 6½ | 54·6 |
| 12 | Farm-yard manure, 30 tons | 8 | 12 | 96 | 2 | 9 | 5½ | 21 | 7 | 3½ | 50·4 |
| 13 | No manure | 6 | 13 | 44 | 2 | 8 | 9½ | 16 | 5 | 5 | 57·8 |
| 14 | Farm-yard manure, 15 tons | 0 | 15 | 80 | 2 | 9 | 4½ | 24 | 3 | 2 | 54·4 |

Plot 9, it will be observed, gives a lighter crop than 6, which had sulphate of ammonia in addition; the increase is, however, insufficient to pay for the additional manure; showing that on soils in good condition a purely mineral manure is generally sufficient.

Both of the plots dressed with farm-yard manure, it will be noticed, show a proportion of diseased tubers much beyond the average of the Series; it must not, however, be concluded that this manure renders the potato crop more liable to disease, for a comparison of the two unmanured plots shows that the tubers on the north side of the field, where Nos. 12 and 14 were also situated, were, as a whole, more highly diseased.

SERIES I.—1871.

This Series is quite an exceptional one, the soil being so

Unmanured Land yielding Nine Tons per Acre.

rich that manure of any kind was unable materially to influence the yield. It occupied another, and seemingly in no respect superior portion of the same field with Series H; but a comparison of the unmanured plots of the two indicate a much higher condition of soil in I.

The potatoes were regents, and proved much more liable to disease than the rocks of Series H. They were planted 12th April, and lifted 18th October.

TABLE XI.—SERIES I.

| No. | Manures in cwts. per acre. | Weight per acre. | | Per cent. diseased. |
|-----|--|------------------|-------------|---------------------|
| | | <i>T.</i> | <i>cwt.</i> | |
| 1 | No manure | 8 | 18 24 | 78·4 |
| 2 | Superphos., $6\frac{1}{4}$; muriate of potash, $2\frac{1}{2}$ | 9 | 5 100 | 74·3 |
| 3 | Superphosphate, $6\frac{1}{4}$ | 9 | 5 0 | 78·3 |
| 4 | Superphos., $6\frac{1}{4}$; sulphate of ammonia, $2\frac{1}{2}$ | 9 | 7 76 | 80·0 |
| 5 | No manure | 9 | 0 40 | 78·4 |
| 6 | Superphosphate, $6\frac{1}{4}$; muriate of potash, $2\frac{1}{2}$; and sulphate of ammonia, $2\frac{1}{2}$ | 9 | 7 36 | 85·6 |
| 7 | Superphos., $6\frac{1}{4}$; m. potash, $2\frac{1}{2}$; sulphate of magnesia, $2\frac{1}{2}$; and s. ammonia, $2\frac{1}{2}$ | 9 | 2 90 | 85·4 |
| 8 | Same as plot 7, with salt, $1\frac{3}{4}$ | 8 | 5 40 | 77·4 |
| 9 | Stable manure, 14 tons | 9 | 2 56 | 76·9 |
| 10 | No manure | 7 | 19 52 | 74·2 |

It is evident that, when the produce of the unmanured soil reaches 9 tons per acre, there is but little scope for manure of any kind. As bearing, however, upon the kainit question, it is noteworthy that, on plot 7, the addition of $2\frac{1}{2}$ cwts. of sulphate of magnesia to the manure of plot 6 reduced the yield; and in plot 8 a further addition of $1\frac{3}{4}$ cwts. salt led to a still greater reduction in the weight of the crop. This last addition might, however, have been doubled, —and still the mixture of muriate of potash, sulphate of magnesia, and salt would have contained more potash than a high class kainit.

In the disease column, the differences above are too slight to signify much; but it may be noticed in passing, that plot

Averages and Comparisons of all the Experiments.

2, with muriate of potash, shows a smaller proportion of diseased tubers than plot 3 without it.

This concludes the details of the Series; and, for the better comparison of the results, the weights will now be averaged on the basis of 1 cwt. of muriate of potash per acre.

AVERAGES AND COMPARISONS.

Muriate of Potash alone.

Under this head, there is but one experiment, that of 1867; in which 4 cwts. increased the produce 22 cwts. and 77 lbs.—equal to 5 cwts. and 75 lbs. per cwt. of muriate of potash. When used in this manner, however, we find that the results are always very variable. In two experiments reported by Dr. Voelcker in the “Journals of the Royal Agricultural Society of England,” for 1867 and 1870, the increase per cwt. ranged from 11½ cwts. to about 18 lbs. of potatoes per acre.

Muriate of Potash with Superphosphate, as against Superphosphate alone.

There are four experiments on this head, but three of them are from Series B, and therefore under exceptional conditions. In this series, in 1868, with 6½ cwts., the acreage value of the crop was increased by 2s. 11d. per cwt. of muriate of potash added; in 1869, by 49s. 6d.; and in 1870, by 62s. 8d. In the other experiment (series 1867), the weight was increased by about 9¼ cwts., equal to 2¼ cwts. of potatoes per cwt. of muriate of potash.

Muriate of Potash, 4 cwts. and Superphosphate, 4 cwts.; against Salt, 4 cwts. and Superphosphate, 4 cwts.

There are three experiments on this point; but one of them, that of 1867, shows a very great decrease from the use of salt, so much so, that its introduction into this comparison would give a false and excessive value to the potash. Confining our attention, then, to the two experiments from Series A and E, we find the muriate of potash superior by nearly 9 cwts. of potatoes per cwt. of muriate of potash applied.

Our Averages confirmed by other published Experiments.

But besides this increase in weight, there is also generally an increase in the quality or size of the tubers, telling favourably on the market value of the crop. In A and E, this amounts to about 8s. per acre, which, added to the value of the extra weight, gives a total of £1 3s. 9½d. as the practical value of each cwt. of muriate of potash in these two experiments.

To the above estimate there is this objection, that the salt in the rival experiments may have increased or *decreased* the yield. That salt does frequently decrease the yield is a well known fact; but, on the other hand, it may be stated that in Dr. Voelcker's two experiments before referred to, salt with superphosphate, gave a slight increase over the latter alone.

The above results are confirmed by Dr. Voelcker's experiments; for, if we take the results of his four, similar in plan to A and E, and of the two just referred to, the average increase of the six is about 9½ cwt. of potatoes per cwt. of muriate of potash—a return only 67 lbs. in excess of our own.

Muriate of Potash with Superphosphate and Sulphate of Ammonia, as against Superphosphate and Sulphate of Ammonia.

There are four experiments on this point. No. 2, series G, with 3½ cwt. of muriate of potash, gave in weight 2 cwt. 111 lbs. of potatoes, and in value 15s. 5d. per cwt. of potash applied. No. 6, series H, with 2½ cwt., gave in weight 7 cwt. and 96 lbs., and in value 28s. 3d. The other two experiments are from the continuous three years' plots, series B, and therefore exceptional; the second year giving £5 3s. 11½d., and the third £4 17s. 10½d. per cwt. of muriate of potash.

Muriate of Potash with Farm-yard Manure.

The most direct experiment on this point was plot 4, series C, with 132 lbs. of muriate of potash (with lime and salt); which increased the yield in 1868 by 11 cwt. 90 lbs.; the quality by 2s. 7¾d. per ton; and the acreage value by £2 9s. 5d. per cwt. of potash. Taking an average of the

Field Value of Potash used in various Combinations.

3 years, these respective increases were 18 cwts. 38 lbs.; 2s. 3¾d.; and £2 17s. 6d. This plot was also the only one of the series that maintained a good paying crop throughout.

On plot 3 a double dressing of muriate of potash slightly reduced the quality, but increased the weight by 13 cwts. 37 lbs.; and the acreage value by £1 9s. 11¼d. per cwt. of muriate of potash. Comparing, also, this plot with No. 1, it will be seen that the mixed salts proved more than a substitute for 5 tons of farm-yard manure.

Muriate of Potash with Lime and Salt.

Series C, plot 10, furnishes the only experiment on this combination. The first year's return was 5s. 8d. per cwt. of potash, and was unprofitable. This is, however, raised to 15s. 8d. by an average of the three seasons; but the conditions were exceptional, and the last season's crop was too small to pay expenses.

The foregoing averages and results are given in the table below; exclusive, however, of the exceptional second and third seasons' weights. This table supplies answers, in a limited way, of course, to the first two of the six questions mentioned on page 366.

TABLE XII.—EPITOME OF THE COMPARABLE RESULTS; SHOWING THE INCREASE PER ACRE IN WEIGHT, QUALITY, AND VALUE, FROM EACH CWT. OF MURIATE OF POTASH APPLIED.

| No. | Cwts. of Manure per acre. | | | | | | Increased weight per acre. | | Value of Improv'd Quality. | | Value of Weight and Quality. | | |
|---------|---------------------------|------------------|--------------|-------|------|------------------|----------------------------|----------|----------------------------|------|------------------------------|-----|-----|
| | Mur. of Potash. | Super-phosphate. | S. of Ammon. | Salt. | Lime | Farm-yard Manure | | | | | | | |
| | | | | | | | Cwt. lb. | Percent. | s. | d. | £ | s. | d. |
| 1 | 4 | ... | ... | ... | ... | ... | 5 75 | 7.88 | ... | ... | ... | ... | ... |
| 2 | 4 | 4 | ... | ... | ... | ... | 2 36 | 1.92 | ... | ... | ... | ... | ... |
| 3 | 4 | 4 | ... | ... | ... | ... | 8 106 | 10.14 | 1 11½ | 1 3 | 9½ | ... | ... |
| 4 | 3½ | 9 | 3 | ... | ... | ... | 2 111 | 2.71 | 10 4½ | 0 15 | 5 | ... | ... |
| 5 | 2½ | 6½ | 2½ | ... | ... | ... | 7 96 | 4.94 | 8 3¾ | 1 8 | 3 | ... | ... |
| 6 | 2¼ | ... | ... | 2¼ | 3¼ | 10 tons | 12 68 | 9.24 | 17 2¼ | 1 18 | 4 | ... | ... |
| 7 | 1½ | ... | ... | 1½ | 1½ | 10 tons | 11 90 | 8.41 | 16 4½ | 2 6 | 5 | ... | ... |
| 8 | 1¾ | ... | ... | 1¾ | 2½ | ... | 2 106 | 2.38 | less | 0 5 | 8 | ... | ... |
| Average | | | | | | | 6 100 | 5.95 | 8 8 | 1 6 | 3¾ | ... | ... |

Value of Sulphate of Ammonia with Muriate of Potash:

The last column is very satisfactory, representing, as it does, *the actual field value of each cwt. of muriate of potash* applied in the respective experiments: the final average, indeed, showing this manure worth £1 6s. 3¼d. per cwt. for potatoes.

Nos. 1 and 2 are from the imperfect experiment of 1867, and would probably value about 14s. and 5s. 9d. respectively. This last is not the lowest value obtained, as plot 5 of series B, 1868, gave only 2s. 11d. per cwt.; but in this case the dressing applied, 6½ cwts., was excessive, and probably prevented due growth.

If we confine our attention to the experiments in which farm-yard manure was not employed, it will be observed that *muriate of potash gives the highest value in No. 5, where it is in conjunction with superphosphate and sulphate of ammonia*. That it should not be used alone, but, as a rule along with superphosphate, is already pretty well established. The addition of sulphate of ammonia is not always, however, accompanied by profitable results, though such seems the rule on light lands. In series B, 1869 and 1870, each cwt. of sulphate of ammonia added to muriate of potash and superphosphate increased the produce by 17 cwts. 7 lbs. In series A and D, in which it was substituted for a portion of the mineral manures, the average return was 19 cwts. 43 lbs.; and in four of Dr. Voelcker's experiments, 13 cwts. 42 lbs. Averaging the gross results of these eight experiments, we get 15 cwts. 81 lbs. of potatoes,—value about 37s.—for each cwt. of sulphate of ammonia so applied. On the other hand, series E and H show an increase of only 3 cwts. 73 lbs.; or an acreage value of 10s. 1d. for each cwt. The soil of series E, it will be remembered, was the heaviest of all, and that of H the best conditioned (I excepted).

These results, therefore, suggest the conclusion that on the *lighter and poorer soils* the addition of sulphate of ammonia to the muriate of potash and superphosphate mixture will be found highly profitable, but that on the *heavier and better conditioned soils* it had better be omitted in whole or

Potash increased the Weight Six per cent., the Quality Three per cent.

in part. This view is confirmed by Dr Voelcker in the journal before referred to.

The column headed "Improved Quality" (*i.e.*, increased size of the tubers) contains some noteworthy items. On Nos. 6 and 7, for instance, it will be seen that the muriate of potash applied was more than paid for by the improvement in quality alone; and that on No. 4 the increase of acreage value from improved quality was about double that from weight. Indeed, on this last plot, had weight alone been the test of profitableness, muriate of potash would have been condemned: but this experiment from series G was peculiar in several respects.

An average of all the experiments shows that the value from improvement of quality is generally about half that from increase of weight, or about one-third the total money return.

In the case of No. 8, a falling away occurred. This amounted to 2s. 2¼d. per acre; and, as before stated, when series C was under consideration, the following season more than repaired this loss. The mixture employed, however,—muriate of potash, salt, and lime,—cannot be recommended for use, except in conjunction with farm-yard manure.

Turning our attention now to Nos. 6 and 7, in which muriate of potash was used along with a half dressing of farm-yard manure, it will be observed that the results were very satisfactory. Not only was the quality greatly improved, but a very considerable increase of weight was also obtained; so much so, that *the practical value of each cwt. of muriate of potash averaged more than £2*. The second and third seasons' results were equally satisfactory; but they have already been discussed when series C was under consideration.

The above results show, as a whole, that *for every cwt. of muriate of potash properly applied, the weight of the crop was increased about 6 per cent., and the quality 3 per cent., or the total acreage value about 9 per cent.*

The Keeping Qualities of the Potatoes Tested.

3. INFLUENCE OF MURIATE OF POTASH ON THE KEEPING QUALITIES OF THE POTATO.

In 1868 and 1869 the medium-sized potatoes of each plot of series A, C, and D, were stored over winter in one long heap. The lots, weighing about 1 cwt. each, were kept strictly separate, and in the following spring, each lot was again picked, and the sound ones weighed. The quantities were small, and as straw was used to separate the lots, they were perhaps unusually well protected. The details will be found in the tables of each series.

Considerable differences were observed in 1868; but in 1869 the loss averaged considerably under 5 per cent.; and no further trials were made.

In series A, the two farm-yard manure plots averaged 26.4 per cent. of loss; the three potash plots, 18.7; superphosphate and salt 15.2; and Peruvian guano, 18.8. In series D, the seven potash plots averaged 11.7; the two without potash, 14.9 per cent.; and plot 11, dressed with farm-yard manure, 16.4 per cent. In series C, where the potash was mixed with lime and salt, and used along with farm-yard manure; 8 cwts. of this mixed manure, when used with 15 tons of farm-yard manure per acre, lessened the keeping qualities considerably: but the same quantity, with only 10 tons of farm-yard manure, proved slightly beneficial; though less so than lime and salt without the potash. The same result is observable on plots 9 and 10, where these mixed manures were used without farm-yard manure; the lime and salt manure again proving superior. These remarks, however, apply only to the results of 1868; the potash plots 4 and 10 proving slightly superior in 1869.

The testimony is thus somewhat conflicting, but the tenor of all the trials tends to show that potash (except when mixed with lime and salt) was found to improve the keeping qualities of the tubers; and that used in conjunction with superphosphate and other salts, *the chemical manures proved much superior in this respect to farm-yard manure.*

Manures have little effect on the Potato Disease.

4. INFLUENCE OF MURIATE OF POTASH UPON THE POTATO DISEASE.

In 1867, when the produce of the farm-yard manure plot was diseased 41·5 per cent., and that of the muriate of potash and superphosphate plot only 16·8, the writer naturally entertained hopes that the potato disease might be limited by potash manures. Series C was planned almost entirely to this end, and series B partially so ; but, fortunately, during the three years of their continuance, the disease did not prevail to any extent in Cumberland ; and not till 1871 were results obtained in any way conclusive. The experience of 1871, however, quite dispelled these hopes ; for a study of the disease columns of series G, H, and I, shows results contradictory and variable, and, as a whole, not confirmatory of those of 1867. In G, indeed, though under very unfavourable conditions, the addition of potash to the other manures seemed to increase the proportion of diseased tubers. In H, again, its use, under more favourable conditions, did not affect the proportion ; and in I its addition in one case lessened, and in another increased the proportion diseased.

A study of over 60 experiments tried by the writer, in which the percentages of the diseased tubers were calculated, shows results so contradictory as to warrant the conclusion that *the nature of the manures has but little effect on the disease*. Salt, as a rule, reduced the proportion diseased, but only by 1 or 2 per cent. Ammonia salts, again, generally slightly increased it ; but there is more than one instance of the opposite effect. An increased quantity of manure also generally increased the proportion diseased ; but to this also there are marked exceptions.

Before leaving this subject, it may not be out of place to mention that, in 1871, three different varieties of potatoes were grown in the same field, and under nearly similar conditions of manure, etc. The proportions diseased of each variety were, however, very dissimilar ; the regents, or rough whites, giving 77·4 per cent. ; the rocks, a later variety, 48·9 ; and the Skerry blues, a still later variety, only 9·2 per cent.

Sulphate of Potash, Muriate of Potash, and Kainit.

It has been stated in some writings on this subject, that no potato covered with three inches of soil had ever been found diseased. Some experiments with large and small potato drills partly support this idea; but in 1871 the writer found many tubers diseased, though covered with over four inches of soil, whilst others in the neighbourhood were untainted, though close to the surface.

5. THE KIND OF POTASH SALT MOST EFFECTIVE.

Our experiments on this point are few and unsatisfactory. In series D, the produce from sulphate of potash showed itself superior to the muriate for both weight and quality in size; but slightly inferior for keeping qualities. As the results of the first year only are reliable, the evidence is rather limited; but it is partly confirmed by our experiments on grass land (page 336), with the two salts applied at the rate of 4 cwts. per acre. In each of these the sulphate proved superior to the muriate; and out of eight similar experiments on grass land reported by Dr. Voelcker, five show the sulphate to be superior.

These facts render it very evident that on some soils the sulphate is more effective; and it is much to be desired that some practical method of economically extracting it from kainit, or other low-class sulphate, were devised.

Kainit, again, was found inferior to muriate of potash in series F. For many purposes it must be so, because of the great amount of foreign salts it contains. When of good quality, kainit and crude potash salts contain from 10 to 13 per cent. of potash; whereas muriate of potash of fair quality (80 per cent. muriate) contains about 51 per cent., or fully four times as much. To supply potash equivalent to $2\frac{1}{2}$ cwts. of the latter would necessitate the application of about 10 cwts. of kainit—a quantity that could not but prove hurtful to the potato crop. These weak potash salts seem more applicable to mangold, which in one published experiment appropriated 15 cwts. of kainit per acre, besides considerable quantities of other manures.

Autumn application has been recommended for these salts, as likely to prevent hurtful effects from the large

Analytic Value of Muriate of Potash.

quantity of soda and magnesia salts which make up three-fourths of their weight. With the magnesia salts the writer has frequently experimented, and without profitable results. (See Index, and page 349.)

Analytically, these two salts would value as follows, taking the potash at 3s. 9d. per unit:—Muriate of potash, of 80 per cent. strength, £9 10s. 7d. per ton; whilst kainit, testing 23 per cent. (equal to 12.42 of potash), would be worth £2 6s. 7d. At 5s. per unit their analytic values would be £12 14s. and £3 2s. 1d. per ton respectively. The kainit, however, as has been shown, is probably worth less.

6. QUANTITY OF MANURE PER ACRE.

With farmyard manure only two quantities of muriate of potash are available for evidence. When used with 15 tons, 2 $\frac{1}{4}$ cwts. of muriate of potash (mixed with 2 $\frac{1}{4}$ of salt and 3 $\frac{1}{4}$ of lime) proved rather too heavy a dose. Used with 10 tons of farmyard manure, the results were much better as to quality, &c.; but the best quality was obtained when only half the above quantities of muriate of potash, salt, and lime were applied. The weight of the crop was, however, considerably less; and the probability is that a medium quantity would answer better than either. For the salt of the mixture, kainit might perhaps be substituted with advantage, and the quantities stand as follows:—Muriate of potash, 1 $\frac{1}{2}$ cwt.; kainit, 1 $\frac{1}{2}$ cwt.; and hot lime, 1 $\frac{1}{2}$ cwt.; the whole to be mixed some weeks before use, and allowed to slake. The heavy yield of plot 6, series C, suggests also, that a mixture of superphosphate (say 2 $\frac{1}{2}$ cwts.) and muriate of potash (1 $\frac{1}{2}$ cwt.) would prove a very profitable addition to a half-dressing of farmyard manure.

Used as an entire substitute for farmyard manure, muriate of potash, superphosphate, and sulphate of ammonia proved the best mixture. A potato manure, containing about 20, 49, and 20 per cent. respectively of these three, was made the subject of experiment in 1870, varying quantities of the manure being applied per acre. Three plots were devoted to each quantity; the average results of which are given in the following table:—

The best Paying Quantities of Potato Manure.

TABLE XIII.—LIGHT *versus* HEAVY MANURING.

| Quantity of Manure per Acre. | Weight per Acre of Potatoes. | | | Value per Acre, less the cost of the Manure. | | |
|---------------------------------|---------------------------------|-------------|------------|---|-----------|-----------|
| | <i>T.</i> | <i>cwt.</i> | <i>lb.</i> | £ | <i>s.</i> | <i>d.</i> |
| 8 cwt. . . . | 8 | 7 | 18 | 11 | 7 | 5 |
| 16 „ | 10 | 16 | 84 | 14 | 17 | 5 |
| 24 „ | 9 | 14 | 22 | 7 | 6 | 4 |
| 32 „ | 10 | 3 | 0 | 6 | 3 | 2½ |

The season was, as before observed, very favourable. The crop was planted 27th April, and lifted in nice condition on 4th and 5th October.

It will be observed that *16 cwt.* proved in every way the best quantity. The yield is, indeed, exceptionally good with all the quantities, that of the 8 cwts. plots being about 22 cwts. per acre over the average yield of similarly manured plots of 1869. The yield shows also the economy of rotation: for these experiments—though after barley (preceded by carrots), top-dressed with nitrate of soda, and though in the same field as series A, B, C, and D,—give a much better return with 8 cwts. of manure, than did plot 6 D with 10 cwts. It would have been highly valuable and interesting, to have followed out the after-effects of such heavy dressings; but the field was not available in 1871.

Another series, begun in 1870 (already detailed on page 298), was carried on for three seasons—6, 9, 15, 18, and 21 cwts. per acre respectively of the same potato manure being applied, and three plots left unmanured as tests of soil-condition. The succeeding crops of wheat and hay were also weighed and valued. The average yield of these three plots was 7 tons 7 cwts. 109 lbs. per acre; showing a higher condition of soil than was desirable for an experiment of the kind; and one likely also to give results unduly high with the smaller quantities of manure. In 1870 the heaviest yield was obtained from the 21 cwts.; but, after deducting the cost of the manures, and setting against it also the produce of the adjacent unmanured plots, the most profitable

Three Cwts. per Acre the best Quantity of Muriate of Potash.

result was that from 9 cwts. of potato manure. The gross produce of the three years also shows the 21 cwts. superior in that respect; but the net returns again show the 9 cwts. most profitable; 21 cwts. coming next, then 18, 15, and, lastly, the 6 cwts. plot. The difference between the net returns of the two best plots was, however, only 6s. 8½d. per acre per annum; so that, in all probability, had the soil not been so rich to begin with, the 21 cwts. would have proved superior in every respect.

The facts, too, that the 9 cwts. alone give a high return, whilst all the other dressings yield in order of quantity, suggest that it was accidental; and support the conclusion that the heaviest dressings were the most profitable throughout.

Series H, however, furnishes an experiment showing a result apparently different from that of the preceding; plot 6, with 11¼ cwts. of manure, giving a crop superior in weight, quality, and freedom from disease to that of plot 11, which had 21¼ cwts. of manure. The manures in this experiment were, however, more concentrated than the potato manure of the two previous experiments, 13 cwts. of the latter being nearly equivalent to the 11 cwts. of Series H.

In these experiments the quantities of muriate of potash applied with successful results were from 2 to 4 cwts., and *the best results were obtained when the quantity did not exceed 3 cwts.* Series G also suggests that, upon very poor soils, a less quantity might be more profitable.

Of the compound potato manures, from 11 to 16 cwts. seems the best quantity; and the proportions should be about as follows:—Muriate of potash, 2½ cwts.; superphosphate, 6½ cwts.; and sulphate of ammonia, 2½ cwts.

Having now considered the foregoing experiments in all their different bearings, it remains but to sum up the results and conclusions in as brief and simple a form as possible.

Brief Summary of Results, &c.

1. That on these light soils each cwt. of muriate of potash properly applied increased the weight of the potato crop by from 3 to 9 cwts. per acre; the average being 6 cwts. 100 lbs.

Summary of the Results.

2. That each cwt. also increased the size (and consequently the market value) of the tubers by from 2s. to 10s. per acre; the average being 8s. 8d.

3. That each cwt. thus increased the gross value of the crop by from 6s. to 46s. per acre, the average being 26s.

4. That muriate of potash, used with a half dressing of farm-yard manure, and at the rate of about $1\frac{1}{4}$ cwts. per acre (with $1\frac{1}{4}$ cwts. of salt and $1\frac{3}{4}$ cwts. of lime), increased the weight of the crop by about 12 cwts., and the quality about 17s.; or the gross value by over £2 per acre.

5. That with farm-yard manure, $1\frac{1}{2}$ cwts. of muriate of potash and $2\frac{1}{2}$ cwts. of superphosphate would prove a valuable mixture.

6. That muriate of potash, used as a substitute for farm-yard manure, should be mixed with other chemical manures.

7. That the following is a good combination:—Muriate of potash, $2\frac{1}{2}$ cwts.; superphosphate, $6\frac{1}{2}$ cwts.; and sulphate of ammonia, $2\frac{1}{2}$ cwts.;—omitting the last-named, or reducing its quantity, for soils in high condition.

8. That from 11 to 16 cwts. per acre of the foregoing is the most effective quantity.

9. That, applied as in Nos. 6, 7, and 8, the quantity of muriate of potash applied should not exceed 3 cwts. per acre.

10. That, applied with farm-yard manure, the quantity should rarely exceed $1\frac{1}{2}$ cwts.

11. That on many soils sulphate of potash is more effective than the muriate; and that for general purposes either is preferable, as a rule, to kainit or other weak potash salt.

12. That, as regards the keeping qualities of the potato tuber, a good chemical manure containing muriate of potash is much superior to farm-yard manure.

13. That muriate of potash is not in any way a preventive of the potato disease.

APPENDIX A

The Review of the fields referred to on page 17, included complete removal of the old hedges and landmarks, made the Many of them proved very similar in result, but the twenty-

| Name of Field on Frontispiece Plan. | Top Soil. | | Subsoil. |
|-------------------------------------|--------------------------|--------|----------------------------|
| | Kind. | Depth. | |
| Bore Hole East. | Good Loam. | 10 in. | Gravel. |
| „ West. | Poor Stony Loam. | 10 „ | „ |
| East Heads East. | Hazel Loam. | 10 „ | Cankery Gravel. |
| „ South. | Stony. | 13 „ | Sandstone. |
| Gardenlow South | Good Hazel Loam. | 13 „ | 18 inch Yellow Clay |
| „ West | Sharp Soil. | 12 „ | and decayed wood |
| Garden high. | Sharp Loam. | 13 „ | Gravel. |
| Gillbushes East. | Good Loam. | 24 „ | Freestone. |
| „ West. | Sandy Loam. | 20 „ | Clay. |
| Gillgooden North | Stony Loam. | 9 „ | 18 inches Blue Sandy Clay. |
| „ South | Dark Loam. | 7 „ | Brick Clay. |
| Longlands East. | Sharp Loam. | 13 „ | Gravel. |
| „ West. | Sharp Hazel Loam. | 12 „ | Sandy Gravel. |
| Manure Croft W. | The very best Dark Loam. | 21 „ | The very best Dark Loam. |
| „ East. | Soil and Clay. | 12 „ | Soil and Clay. |
| Mid-Heads Top. | Good Loam. | 10 „ | Gravel. |
| „ North. | Sharp Loam. | 15 „ | „ |
| Moss East. | Peat Soil. | 24 „ | White Marl. |
| „ West. | Sharp Red Loam. | 9 „ | Grey Rock. |
| Nursery South. | Hazel Loam. | 13 „ | Sandy Gravel. |
| „ North. | „ | 15 „ | Gravel. |
| Tail Race East. | Fine Good Loam. | 21 „ | Sandy. |
| „ West. | Stony Hazel Loam. | 24 „ | „ |
| Wet-Flat East. | Good Loam. | 14 „ | Gravel. |
| „ West. | „ | 10 „ | „ |
| West Heads. | Sharp Hazel Loam. | 15 „ | „ |

(From Page 17).

seventy-six observations on the depth, &c., of the soil; but, the identification of the positions of these test-holes a little difficult. six given below contain the gist of the whole.

| Crop in 1861, and present state of the Soil. | Remarks. |
|--|---|
| Oat stubble. Hay last year, grazed this. Hay. Hay. | Blackish, a mixture, soil and clay, dirty stuff, perhaps wood field, except hill, wants draining, a good many stones. Some large stones, most of it red, part of it black, half drained. Good, few stones, wants draining. Very stony, wants much draining. |
| Grass one year. Grazed one year. Potatoes. Potatoes. Meadow and wheat stubble. Wheat stubble. Hay. Potatoes. Two years in grass. Grass for six years. | Very strong, top soil gravelly. Better with more drains. Rather stony. Wants a little draining. Stiff clay, wants a good deal of draining. West side good for turnips. East side black and sandy, half drained. Black, many large stones, wants draining. Rather stony. Wants more drains. It wants draining. |
| Turnips after " Oats. | Red Turnip " field. |
| Meadow. " | Black. " |
| Grass hay last year, grazed this. | Some good soil at the edges. Bad with stones, and wants draining. |
| Turnips after " Oats. " | Not very stony. " " |
| Wheat stubble with seeds. | First-rate. |
| Oat stubble. | A few stones. |
| Grass hay last year, grazed this. | Blackish, mixed soils, a good many stones, wants draining. Nice red land on west side, imperfectly drained, some large stones. |

[Ere this, the reader will have seen ample evidence of what he was told in the introductory chapter, what he might rightly regard as instances of a passion for self-disparagement on the part of the authors of this book. Who but they, after ten years of adventurous and costly exertion for the advantages of others, would inquire among their neighbours for any who had objectionable remarks to make, and actually go to the expense of publishing them? If, therefore, the reader, in perusing this book, has not himself formed an unfavourable opinion of the unusual proceedings described, he will find some sharply cut, ready to that purport, provided for him. The spirit, however, in which adverse opinion was sought, and has been quoted, is a creditable one. The desire of Mr. Lawson being to put the reader in possession of both sides of the question, so that what was really practicable in the affair might the better appear. The authors of the chapters in this book make no attempt to do themselves justice. So far from making the worse appear the better reason, they make the better reason appear the worse. However, one of the most adverse critics admits that if fewer things had been attempted, and those began had been persisted in, a paying result would have been attained, despite their latitudinarianism of universal discussion, and the inevitable errors of amateur farming in its earlier stages.—G. J. H.]

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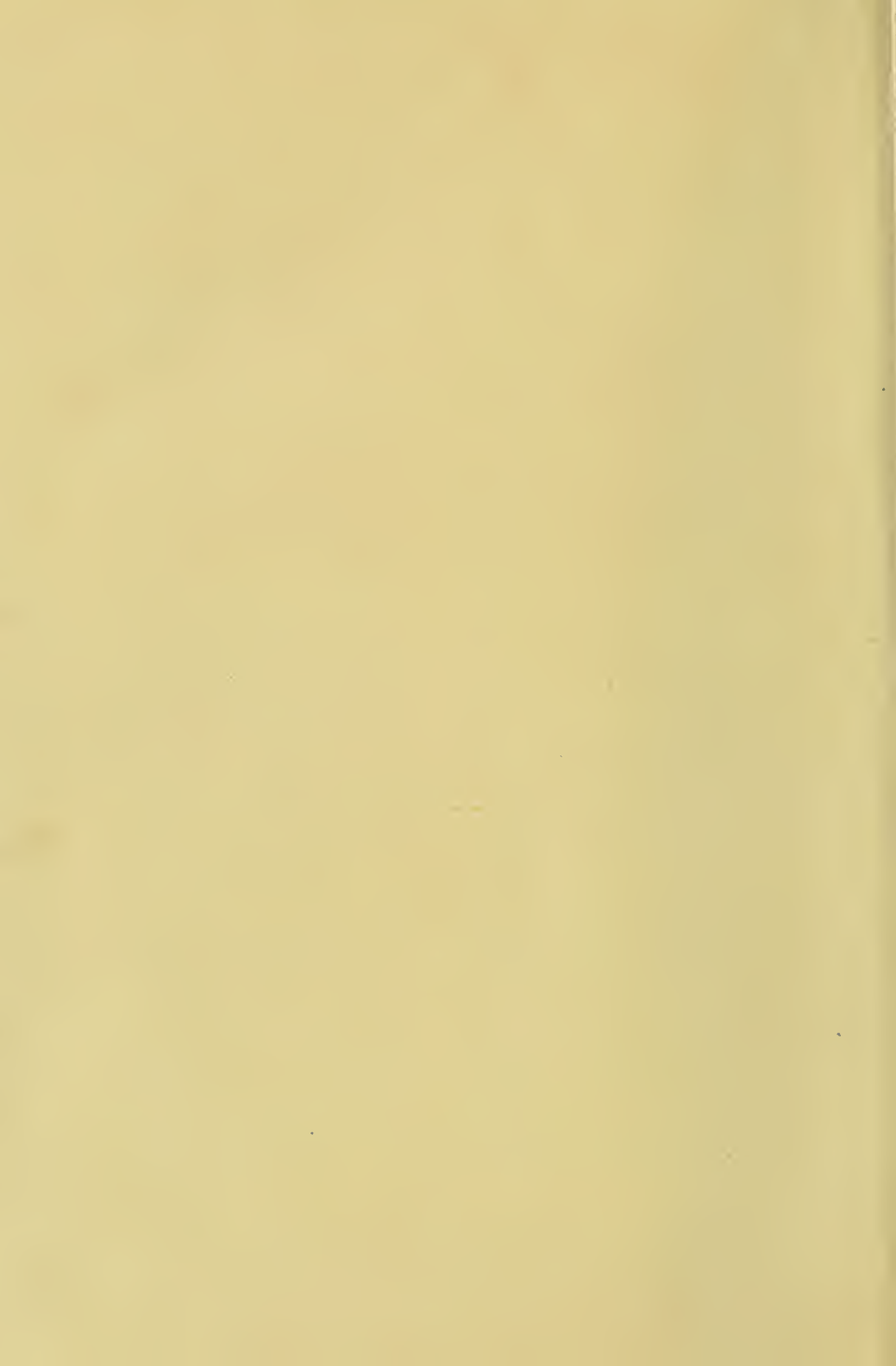
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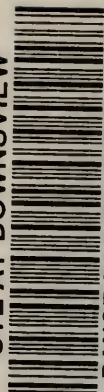
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